

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 2

DATE: OCT - 4 2016

SUBJECT: Core TSCA Inspection: Troy Chemical Corporation
1 Avenue L
Newark, NJ 07105

FROM: Mark Bean, Life Scientist
Toxics Section

TO: Susan Schulz, Chief
Toxics Section

EPA Region 2 Toxic Substances Control Act inspector Mark Bean conducted a TSCA Sections 5, 8, 12, and 13 inspection at Troy Corporation (Troy) at its headquarters in Florham Park, NJ, where Troy keeps the records for its facility located at 1 Avenue L in Newark, NJ, on September 26, 2016. I sent an email (Attachment 1) to Mr. Adrian Krygsman, Director Product Registration, on September 22, 2016, detailing the information EPA was seeking during the inspection.

BACKGROUND:

This facility was targeted for a neutral scheme inspection in support of the Making A Visible Difference in Communities initiative. I pulled reports from EPA's Envirofacts Warehouse and from the Integrated Compliance Information System. I also reviewed the 2012 Chemical Data Reporting submission for the facility. Troy submitted a Chemical Data Reporting report in 2012. The site visit was conducted in Florham Park because Mr. Krygsman informed me that the information sought was available at Troy's headquarters office, not at the manufacturing site.

DISCUSSION AND PROCESS REVIEW:

Credentials were presented to Mr. Krygsman who failed to sign the Notice of Inspection, however did sign the Confidentiality Acknowledgement form. Nothing in Mr. Krygsman's behavior suggested that this was an intentional act.

I explained the purpose of the inspection. Mr. Krygsman indicated that the materials submitted to EPA were considered to be Confidential Business Information.

The Newark facility has a primary NAICS code of 325510 with two secondary codes 325320 and 424690. Mr. Krygsman began with a short company history for the Newark facility containing site-specific information. The facility has been operated by and is wholly owned by Troy Corporation since the 1950's. In the mid-70's, Troy shifted its Newark production to industrial biocides. In recent years, that production was transferred to Troy's facility in Phoenix,

Arizona. Other chemical manufacturing has been relocated to Troy's facility in Thailand. He stated that the Newark facility does import chemical substances as inert ingredients and that it is otherwise strictly a blending operation formulating pesticides. He said that most of the imports were from their plant in Thailand and come through ports in Newark, Savannah, Houston and Los Angeles. The company uses AS 400 software to monitor chemical production and cannot create spreadsheets so the CDR had to be filled out manually from hard copy summaries. According to Mr. Krygsman, the Newark facility site is being evaluated for federal Superfund designation, meaning that there are no storm water discharges allowed to the adjacent creek. Annual sales are greater than \$40 million.

Troy did not have any PMNs, SNURs, 5(e) or 5(f), and no R&D applicable to the Newark facility. However, some of the pesticides inert and other ingredients may require a PMN if they are subject to TSCA.

R&D consists of compatibility testing of pesticides formulations.

Troy submitted a copy of its procedure for verifying compliance of new products, non-confidential Sample Number 092616187050101.

There were no 8(c) reports in the last five years, and there have been no 8(e) reports from the Newark facility.

Imported raw materials are the only chemical substances subject to TSCA at the facility. Each raw material is designated with the letter R in the inventory system. Mr. Krygsman stated that an intermediate called DIDM was isolated during the one of their processes. [Note: needs further evaluation].

Mr. Krygsman explained that Troy creates a custom safety data sheet for each chemical used or formulated through a system he called "intelligent authoring." This is an automated software that updates monthly and flags CASRN's that have regulatory concerns such as TSCA or REACH. The system then generates the required safety measures. Troy then conducts specific training through their training coordinator who ensures documentation.

Mr. Krygsman stated that there is no PCB electrical equipment on site. Also, that he files an annual Community Right to Know report. He said that there are no longer any TRI chemicals at the site since moving the manufacturing operations overseas.

TOUR OF THE FACILITY:

There was no facility tour.

CLOSING CONFERENCE.

Mr. Krygsman signed the Receipt for Samples and the Confidential Declaration form. Two hard copy samples were collected (092616187050101 and 092616187050102. The third sample is the full response submittal due to the R2 DCO by October 31, 2016. I summarized the information requested and how it was to be sent to R2.

ATTACHMENTS

1. Pre-inspection email
2. Envirofacts Report
3. TSCA Forms

Troy Chemical Corporation
One Avenue L
Newark, NJ 07105

The inspection will be conducted pursuant to Section 11 of the Toxic Substances Control Act (TSCA) to determine compliance with TSCA Sections 5, 8, 12 and 13, and will be specific to this facility. The inspection is anticipated to take between two and four hours. Please prepare a briefing on your company's history, products, and general facility information such as number of employees, NAIC code(s), DUNS Number, etc., as an introduction. At some point, the inspector will conduct a brief walkthrough of the facility, usually after a discussion of the manufacturing processes (see Document 6, below).

Please make available the following documents, lists, and other information on electronic media (CD/DVD/USB Flash Drive) as an Adobe portable document file (.pdf) for the inspector to examine. You may print any document for clarity, otherwise, we prefer to be paperless. You will be asked to send a copy of the electronic files to the Region 2 Document Control Officer (name and address below). For each **list** requested, also include a separate Microsoft Excel Workbook. If this facility is not engaged in the activities for which information is requested, please state the activity and confirm that it is not applicable to this facility.

☐ Document 1. For chemical substances (including intergeneric microorganisms) manufactured, imported or processed at this facility, include all Premanufacture Notice(s) (PMN) or microbial commercial activity notice(s) (MCAN) submitted by your company, or request(s) for exemption from the PMN/MCAN review process, including Low Volume, Test Marketing, Polymer Exemptions, TSCA Experimental Release Applications, certification for exemptions pursuant to 40 C.F.R. § 725.234, Tier I and Tier II exemptions for new microorganisms, and any EPA responses to these submittals or requests since January 1, 2012;

☐ Document 2. For chemical substances manufactured, imported or processed at this facility, Bonafide Intent(s), Significant New Use Rule Notices, and/or TSCA Section 5(e)/(f) Consent Orders for the last five years;

☐ Document 3. Research and development activities and procedures in effect at the facility, specifically as related to compliance with the requirements of a TSCA Research and Development Exemption;

☐ Document 4. Recordkeeping and reporting under TSCA Section 8 Rules, including the Preliminary Assessment Information Rule (PAIR), Inventory Update Rule (IUR) and TSCA Sections 8(c), 8(d), and 8(e) for the last five years;

☐ Document 5. Facility and/or corporate policies developed to ensure compliance with TSCA Sections 4, 5, 8, 12 and 13:

☐ Document 6. Manufacturing and process diagrams for each chemical produced at the facility. Indicate all steps including on-site use, marketing, transfer, recycling, and waste disposal. Also

include chemicals that are not intended for sale or distribution, such as byproducts and impurities. For exemption under 40 C.F.R Part 725, Subpart E, describe the structure and containment and/or inactivation controls;

☐ Document 7. For each chemical reacted or processed at the subject facility, indicate if the subject facility is a toll manufacturer or a co-manufacturer of the chemical (if so, include the name of the party for whom the chemical is manufactured), whether the manufacturing process is continuous or batch, and how many employees are directly involved with the manufacturing process for each chemical (including engineers, foremen, packagers and handlers); and,

☐ Document 8. A Copy of Record of the 2016 Chemical Data Reporting submittal filed by or on behalf of the subject facility.

List # 1:

Prepare a list of chemical substances that were imported or manufactured between January 1, 2012, and December 31, 2015, in tabular format. The list should include the following information for each chemical substance:

1. Accepted chemical name;
2. Chemical Abstracts Service Registry Number (CASRN) or the EPA accession number;
3. Brand name or product identifier;
4. If the substance is a mixture, indicate the CASRN or the EPA accession number and percentage of each component;
5. Production (including import) date;
6. Indicate if the chemical is a byproduct, is an impurity, or is an intermediate. If you identify a chemical as a byproduct or an intermediate, indicate in the process diagrams (Document 6) how it is produced; and,
7. Volume in pounds or kilograms produced (a) annually if by continuous process, or (b) per batch and batch number, or (c) quantity imported per shipment and shipment number, as applicable to the chemical substance or mixture.

List # 2:

Prepare a list of all the chemical substances (including mixtures) that were processed at the facility acquired from domestic suppliers (U. S. distributors) between January 1, 2012, and December 31, 2015. Please limit this list to materials that are directly related to the facility's chemical manufacturing process(es). The list should include the following information for each component:

1. Brand or product name;
2. Accepted chemical name(s) of each component;
3. CASRN or the EPA accession number of each component; and,
4. The supplier.

List 3

Prepare a list chemical substances and the components of each mixture of the products that were exported to foreign countries between January 1, 2012, and December 31, 2015. List each unique

CASRN only once and only if the chemical substance makes up one percent or greater of the volume of the product. The list should include the following information for each component:

1. Accepted chemical name of each component;
2. CASRN or the EPA accession number of each component;
3. The percentage of each component;
4. The destination country or countries; and,
5. A copy of any export notification(s) required under TSCA 12(b).

Terms used in this document are defined in the Code of Federal Regulations, Chapter 40, Sections 704.3, 704.25, 704.33, 707.63, 710.3, 710.43, 711.3, 712.3, 716.1, 717.3, 720.3, 721.3, and 725.3 (40 C. F. R. §704.3, 704.25, 704.33, 707.63, 710.3, 710.43, 711.3, 712.3, 716.1, 717.3, 720.3, and 721.3).

If you are unable to provide the identity of the chemical substances or mixtures because your suppliers or customers have a Confidential Business Information (CBI) claim on the products that were purchased domestically, imported or exported, please identify those products along with the suppliers and have them available during the inspection. The records associated with this inspection/information request should be submitted to

Mr. Mark Bean
Document Control Officer
U.S. EPA Region 2 Edison
Toxics Section
2890 Woodbridge Avenue, MS-10
Edison, New Jersey 08837-3679

Pursuant to the Code of Federal Regulations, 40 CFR, Part 2, Subpart B, you are entitled to claim as CBI any or all of the information provided to EPA; this is applicable only if the claim is consistent with the procedures described in the regulations cited above. If you do not assert a confidentiality claim at the time the information is provided to EPA, it may be released to the public without further notice.

If you have any questions, please contact Mr. Bean of the EPA Region 2 staff at (732) 321-6606.



US ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460
TOXIC SUBSTANCES CONTROL ACT
TSCA INSPECTION CONFIDENTIALITY NOTICE

1. INVESTIGATION IDENTIFICATION

DATE *9/26/2016* INSPECTOR NO. **F18705** DAILY SEQ. NO. **1**

4. FACILITY NAME

Troy Chemical Corporation

2. INSPECTOR=S NAME

James Bean

5. ADDRESS

1 Avenue L Newark NJ 07105

3. INSPECTOR=S ADDRESS

US-EPA Region 2 MS-105
2890 Woodbridge Avenue
Edison, NJ 08837-5602

6. NAME OF CHIEF EXECUTIVE OFFICER

Dory I D. Smith

7. TITLE

PRESIDENT

TO ASSERT A TSCA CONFIDENTIAL BUSINESS INFORMATION CLAIM

It is possible that EPA will receive public requests for release of the information obtained during the inspection of the facility cited above. Such requests will be handled by EPA in accordance with provisions of the Freedom of Information Act (FOIA), 5 USC 552; EPA regulations issued thereunder, 40 CFR, Part 2; and the Toxic Substances Control Act (TSCA), Section 14. EPA is required to make inspection data available in response to FOIA requests unless the EPA Administrator determines that the data is entitled to confidential treatment, or may be withheld from release under other exceptions of FOIA.

Any or all information collected by EPA during the inspection may be claimed as confidential if it relates to trade secrets, commercial, or financial matters that you consider to be confidential business information (CBI). If you assert a CBI claim, EPA will disclose the information only to the extent, and by means of the procedures set forth in the regulations (cited above) governing EPA=s treatment of CBI. Among other things, the regulations require that EPA notify you in advance of publicly disclosing any information claimed as CBI.

A CBI claim may be asserted at any time prior to or during the inspection. If a CBI claim is received after the inspection, EPA will make such efforts as are administratively practicable to protect the information. However, EPA cannot assure that such efforts will be effective in light of the possibility of prior disclosure. If it is more convenient for you to assert a CBI claim on your own stationary or by making the individual documents or samples ATSCA confidential business information, it is not necessary for you to use this notice. The inspector will be glad to answer any questions you may have regarding EPA=s CBI procedures.

While you may claim any collected information or sample as CBI, such claims are not likely to be upheld if they are challenged unless the information meets the following criteria:

1. Your company has **taken measures to protect** the confidentiality of the information and it intends to continue to take such measures.

2. The information is **not, and has not been, reasonably obtainable** without your company=s consent by other persons (other than governmental bodies), or by use of legitimate means (other than discovery based on showing of special need in a judicial or quasi-judicial proceeding).
3. The information is **not publicly available** elsewhere.
4. Disclosure of the information would cause **substantial harm** to your company=s competitive position.

At the completion of the inspection, you will be given a receipt for all documents, samples, and other materials collected. At that time, you may make claims that some or all of the information is CBI.

If you are not authorized by your company to assert a CBI claim, this notice will be sent by certified mail, along with the receipt for documents, samples, and other materials to the Chief Executive Officer of your company within 2 days of this date. The Chief Executive Officer must return a statement specifying any information which should receive CBI treatment.

The statement from the Chief Executive Officer should be addressed to:

James Bean, TSCA DCO
USEPA-Region 2
2890 Woodbridge Avenue
Edison, NJ 08837

and mailed by registered, return-receipt requested mail within 7 calendar days of receipt of this notice. Claims may be made at any time after the inspection, but the inspection data will not be entered into the TSCA/CBI security system until an official confidentiality claim is made. The data will be handled under EPA=s routine security system unless and until a claim is made. If no confidentiality claim accompanies the information when it is received by EPA, the information may be made available to the public without further notice to the business.

TO BE COMPLETED BY FACILITY OFFICIAL RECEIVING THIS NOTICE
I have received and read the notice.

If there is no one on the premise who is authorized to make CBI claims for this facility, a copy of this notice and other inspection materials will be sent to the company=s Chief Executive Officer. If there is another official who should also receive this information, please designate below.

Certification

I acknowledge that the statements I have made on this form and all attachments thereto are true, accurate, and complete. I acknowledge that any knowingly false or misleading statement may be punishable by fine or imprisonment or both under applicable law.

SIGNATURE

Adrian Krygsman

NAME

NAME

Adrian Krygsman

TITLE

TITLE

DIRECTOR, PROD REG.

DATE SIGNED

9/26/2016

ADDRESS



US ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

TOXIC SUBSTANCES CONTROL ACT

TOXICS SECTION -- NOTICE OF INSPECTION

1. INVESTIGATION IDENTIFICATION			2. TIME	3. FACILITY NAME
DATE 9/26/2016	INSPECTOR NO. F18705	DAILY SEQ. NO. 1	9:45 AM	Troy Chemical Corporation
4. INSPECTOR=S ADDRESS US-EPA Region 2 MS-105 2890 Woodbridge Avenue Edison, NJ 08837-5602			5. FACILITY=S ADDRESS 1 Avenue L Newark NJ 07105	

REASON FOR INSPECTION

Under the authority of Section 11 of the Toxics Substances Control Act:

☒ For the purposes of inspecting (Including taking samples, photographs, statements and other inspection activities) an establishment, facility, or other premises in which chemical substances or mixtures or articles containing same are manufactured, processed or stored, or held before or after their distribution in commerce (including records, files, papers, processes, controls, and facilities) and any conveyance being used to transport chemical substances, mixtures, or articles containing same in connection with their distribution in commerce (including records, files, papers, processes, controls, and facilities) bearing on whether the requirements of the Act applicable to the chemical substances, mixtures, or articles within or associated with such premises or conveyance have been complied with.

☐ In addition, this inspection extends to (Check appropriate blocks):

- | | |
|--|--|
| <input type="checkbox"/> A. Financial data | <input type="checkbox"/> D. Personnel data |
| <input type="checkbox"/> B. Sales data | <input type="checkbox"/> E. Research data |
| <input type="checkbox"/> C. Pricing data | |

The nature and extent of the inspection of such data specified in A through E above is as follows:

Certification

I acknowledge that the statements I have made on this form and all attachments thereto are true, accurate, and complete. I acknowledge that any knowingly false or misleading statement may be punishable by fine or imprisonment or both under applicable law.

INSPECTOR SIGNATURE 		FACILITY REPRESENTATIVE SIGNATURE	
NAME James Bean		NAME	
TITLE Life Scientist	DATE SIGNED 9/26/2016	TITLE	DATE SIGNED



US ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

TOXIC SUBSTANCES CONTROL ACT

TOXICS SECTION B RECEIPT FOR SAMPLES AND DOCUMENTS

1. INVESTIGATION IDENTIFICATION

DATE 9/26/16	INSPECTOR NO. F18705	DAILY SEQ. NO. 1
-----------------	-------------------------	---------------------

2. COMPANY NAME

Troy Chemical Corporation

3. INSPECTOR ADDRESS
US-EPA Region 2 MS-105
2890 Woodbridge Avenue
Edison, NJ 08837-5602

4. COMPANY ADDRESS

1 Avenue L Newark NJ 07105

The documents and samples of chemical substances and/or mixtures described below were collected in connection with the administration and enforcement of the Toxic Substances Control Act.

RECEIPT OF DOCUMENT(S) DESCRIBED IS HEREBY ACKNOWLEDGED:

NO.	DESCRIPTION
092616187050101	Hard copy QUALITY SYSTEM PROCEDURE, 4 pages single sided
092616187050102	Seven corporate brochures of product lines.
092616187050103	Electronic media containing inspection submittal. CBI. To be sent through R2 TSCA DCO.

Optional:

Duplicate or Split samples: Requested and Provided ☐ Not Requested ☒

Certification

I acknowledge that the statements I have made on this form and all attachments thereto are true, accurate, and complete. I acknowledge that any knowingly false or misleading statement may be punishable by fine or imprisonment or both under applicable law.

INSPECTOR SIGNATURE

NAME

James Bean

TITLE

Life Scientist

DATE SIGNED

9/26/16

COMPANY REPRESENTATIVE SIGNATURE

NAME

Adrian Krygsmar

TITLE

DIRECTOR, PROD. REG.

DATE SIGNED

9/26/16



EPA

US ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460
TOXIC SUBSTANCES CONTROL ACT

DECLARATION OF CONFIDENTIAL BUSINESS INFORMATION

1. INVESTIGATION IDENTIFICATION

DATE 9/26/16	INSPECTOR NO. F18705	DAILY SEQ. NO. 1
-----------------	-------------------------	---------------------

2. COMPANY NAME

Troy Chemical Corporation

3. INSPECTOR ADDRESS
US-EPA Region 2 MS-105
2890 Woodbridge Avenue
Edison, NJ 08837-5602

4. COMPANY ADDRESS
1 Avenue L Newark NJ 07105

For internal EPA use. Copies of this form may be provided to recipient as acknowledgement of TSCA confidential documents described below collected in connection with the administration and enforcement of the Toxic Substance control Act.

NO.	DESCRIPTION
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092616187050103	Electronic media containing inspection submittal.
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To be sent to R2 Edison TSCA DCU.
Date TBD but not later than October 31, 2016.

INSPECTOR SIGNATURE

CLAIMANT SIGNATURE

NAME

James Bean

NAME

Adrian Krygsmann

TITLE
Life Scientist

DATE SIGNED
9/26/16

TITLE
Director IPROD-REG

DATE SIGNED
9/26/16

RE: subject of phone conversation

Thu 8/17/2017 11:38 AM

To: Bean, Mark <Bean.Mark@epa.gov>;

Mark reviewed the data for the report and based on the review we will need to revise the CDR. Let me explain the discrepancies:

CAS Number	Substance	CDR reported value	Corrected value
67-68-5	Dimethyl Sulfoxide	59520	79360
30525-89-4	Paraformaldehyde	1659589	485,016
25498-49-1	Propanol, [2-(2-methoxy sources (will CDR report)	68376	obtained from local remove from the

Mark I intend to use CDX to revise the report with these corrections. CDX has been problematic on my computer and I have my IT group working to resolve the situation so I can do this by end of next week. Let me know if you want a copy and I will send to you be email or via courier as CBI.

Regards,

Adrian Krygsman
Director, Product Registration
Phone: 973-443-4200, X2249
Mobile: 973-943-0503
Email: krygsmaa@Troycorp.com



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From: Bean, Mark [mailto:Bean.Mark@epa.gov]
Sent: Tuesday, August 15, 2017 2:27 PM
To: Krygsman, Adrian
Subject: subject of phone conversation

Good afternoon, Adrian

The file is:

Copy of Newark 0181 Raw Material Receipt – with Supplier 10-26-16. Processed.Newark.xlsx.

Thanks for checking.

8/17/2017

RE: subject of phone conversation - Bean, Mark

Mark

Mark Bean

U.S. Environmental Protection Agency – Region 2

Pesticides & Toxic Substances Branch

2890 Woodbridge Avenue

Edison, NJ 08837

Phone: 732-321-6606; Fax: 732-321-6788

Now - CBI

QUALITY SYSTEM PROCEDURE

Page 1 of 4

New Product Development - A Modified Stage Gate System			Procedure No: P731
Supersedes: P0731-08 (10/05/11)	Originator: A. Gonzalez	Approved By: I. Colon	Effective Date:

I. Purpose

To define Troy Chemical Corporation System for the selection, development and realization of products.

II. Scope

New Product Development Committee and Commercialization Committee represent the core attendees for meetings to mentor and coordinate design activities of the new product realization process.

A New Product Development Proposal (NPDP) serves as plan and record for the development of proposed new products and product reformulations.

It is not necessary to prepare a NPDP for technical service work, resale products or other simple technical projects. Decisions regarding proposed new resale products are handled by the regional Commercialization Committees.

The New Product Development Committee (NPDC, 'gate keepers') authorizes initiation, continuation, modification and rejection of any NPDP at a New Product Development Meeting.

III. Procedure

- A. It is the responsibility of the New Product Development Committee to select, review and direct product realization.
- B. Directors, Research & Development are responsible for planning research and development activities in their geographic areas of responsibility.
- C. The New Product Development Proposal (in three parts F731, F7311, and F7312) constitutes:
 - 1. The justification and planning for the product (F731),
 - 2. The product definition for the developmental work (F7311), and
 - 3. The tracking for output matching to inputs (F7312).
- D. The Minutes of the New Product Development Meetings (NPDP Meetings) provide documentation of proposed new projects and decisions for graduation or cessation of development activities. The NPDC records its review activities on the NPDP graduation forms (F7313, F7314, F7315, F7316) with decisions, signature

092616187050101

MB

QUALITY SYSTEM PROCEDURE

Page 2 of 4

New Product Development - A Modified Stage Gate System			Procedure No: P731
Supersedes: P0731-08 (10/05/11)	Originator: A. Gonzalez	Approved By: I. Colon	Effective Date:

endorsed. The signed NPDP graduation forms are entered to the appropriate project folder maintained by the Science and Technology Office.

- E. NPDP Meeting reviews include assignment of specific projects to a specific laboratory and region; review of success criteria (critical-to-quality product characteristics) for graduation of specific projects, and authorization to graduate, terminate or inactivate (dormant status) a specific project.
- F. Any formulation change made to a new product after it has entered into NPDP Stage 2 and a technical transfer has been completed must be documented by the product developer and presented to those functions involved in the technical transfer process.
- G. New Product Development Proceedings follow five steps and pass four gates.

Idea Stage: Minutes record meritorious ideas presented by the originator and discussed openly at the New Product Development Meeting. Serious consideration is given ideas for which a New Product Development Proposal records as much data as can be gathered, projected and developed with qualified certainty.

Gate 1: Only ideas selected by the New Product Development Committee (NPDC) pass this gate to the Laboratory Development stage. The selection is recorded in the Minutes of the NPDP Meeting. The Director of R&D will assign resources to the project and develop a Stage 1 project plan. The project plan will contain the following:

- Resources assigned to the project and the project leader
- Prior art search and analysis of any potential barriers
- Experimental plan of attack for the project
- Milestones for the project
- Frequency of project status reporting

Stage 1, Laboratory Development: Initial "Science and Technology" data is combined with information developed by Sales/Marketing and entered to the ongoing NPDP project. In this stage, the basic laboratory work is done to reduce the product concept to reality by meeting all the requirements (success criteria) for the product established in the NPDP forms. Once a formulation that meets the basic criteria is identified, then the Bill of Materials for the potential product will be submitted to Supply Chain and Regulatory to ensure that there are no potential sourcing or regulatory issues with any of the raw materials. Once sign-offs from

QUALITY SYSTEM PROCEDURE

Page 3 of 4

New Product Development - A Modified Stage Gate System			Procedure No: P731
Supersedes: P0731-08 (10/05/11)	Originator: A. Gonzalez	Approved By: I. Colon	Effective Date:

Supply Chain and Regulatory are achieved, then the appropriate R&D Director will prepare a report to graduate the product to Stage 2 and will submit that report to the NPDC before the next meeting. The NPDC will review, contribute, and assess the potential for meeting customer needs and market place requirements.

Gate 2: Product ideas and prototypes continuing to demonstrate significant potential to meet customer, market place and corporate inputs requirements (including stability information) will be passed through this gate by the NPDC.

Stage 2, Market Development: Market validation begins commencing with a favorable review by the NPDC and the assignment of an experimental product identification. A product may undergo several reviews by the NPDC during this stage. Pilot plant investigation and process studies begin. Development of promotional data and information begins, as well as the generation of a technical transfer package. The determination for the need of product registration takes place. Market place, S & T, and Pilot Plant process studies may warrant changes for product improvement. NPDC reviews, acknowledges, underwrites changes or directs cessation of activity. Samples of the product can be made available to customers only by approval of the NPDC at this stage.

Gate 3: Potential products indicating market place acceptance will be passed through this gate. Mandatory deliverables include: MSDS, Product Information (or TDS), complete technical transfer package, commercially prepared sample stock, pricing guidelines, sales training and other selling tools, as well as a sign off by Supply Chain and Operations. Also commercial names are agreed upon that conform to Troy's naming conventions. The NPDC delegates the responsibility for product review and approval to the regional Commercialization Committees, which will hold periodic meetings to ensure that all requirements listed above are met for each product. The regional Commercialization Committee will provide meeting minutes and product overviews ('Product Commercialization List') to document graduation and current status of the projects in the commercialization process. The approval by the Commercialization Committee graduates the new product to NPDP Stage 3.

Stage 3, Market Introduction: Favorable review by the Commercialization Committee allows the product to be introduced for sales in the market place with the clear understanding that sufficient lead time must be provided for initial sales. This lead time will take into account not only production scheduling needs, but also any regulatory time constraints. Training is provided to the sales force on how to promote the product relative to competitive products (advantages and

QUALITY SYSTEM PROCEDURE

Page 4 of 4

New Product Development - A Modified Stage Gate System			Procedure No: P731
Supersedes: P0731-08 (10/05/11)	Originator: A. Gonzalez	Approved By: I. Colon	Effective Date:

benefits), as well as how to position the product in the market and in Troy's product line. Customer presentations are prepared and made, and samples are provided to customers from either pilot plant or trial production runs. Lab prepared samples are not allowed at this stage.

Gate 4: Products without market place detractors, displayed continual acceptance improvement, economic profit and demonstrated production history (at least 25 batches) will pass this gate.

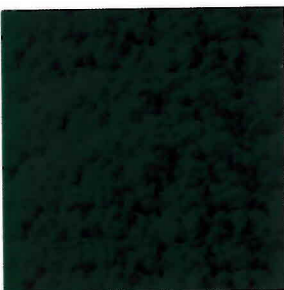
Stage 4, Full Commercialization: The New Product Development Committee passes full responsibility over to Operations and Product Management.

REVISION HISTORY		
Revision	Reason for Revision	Effective Date
0	Initial Issue	11/12/02
1	Revision to "Scope" paragraph and "Procedure" paragraph, section 2.	12/17/02
2	Revision to "Procedure" paragraph, section 6.	12/23/02
3	Revision to "Procedure" paragraph, section 6 – stage 2.	7/3/03
4	Revision to "Procedure" paragraph, section 6 – gate 1.	12/5/03
5	Revision to "Procedure" paragraph. New section #6 added to address the fact that new product developer must communicate any changes in formulation once a tech transfer has been done for a product. Old section #6 became section #7.	4/26/04
6	Revision to "Procedure" paragraph, Section #3.	5/10/04
7	Revision to Flow Chart and procedural text	4/27/05
8	Convert document to new format and numbering convention; removed obsolete flow chart, updated form numbers.	5Oct11
9	Revision to describe the role of the regional Commercialization Committees in the NPDP process.	20Sept16

JWP

POWDERMATE®

TECHNOLOGY FOR SUPERIOR
POWDER COATINGS



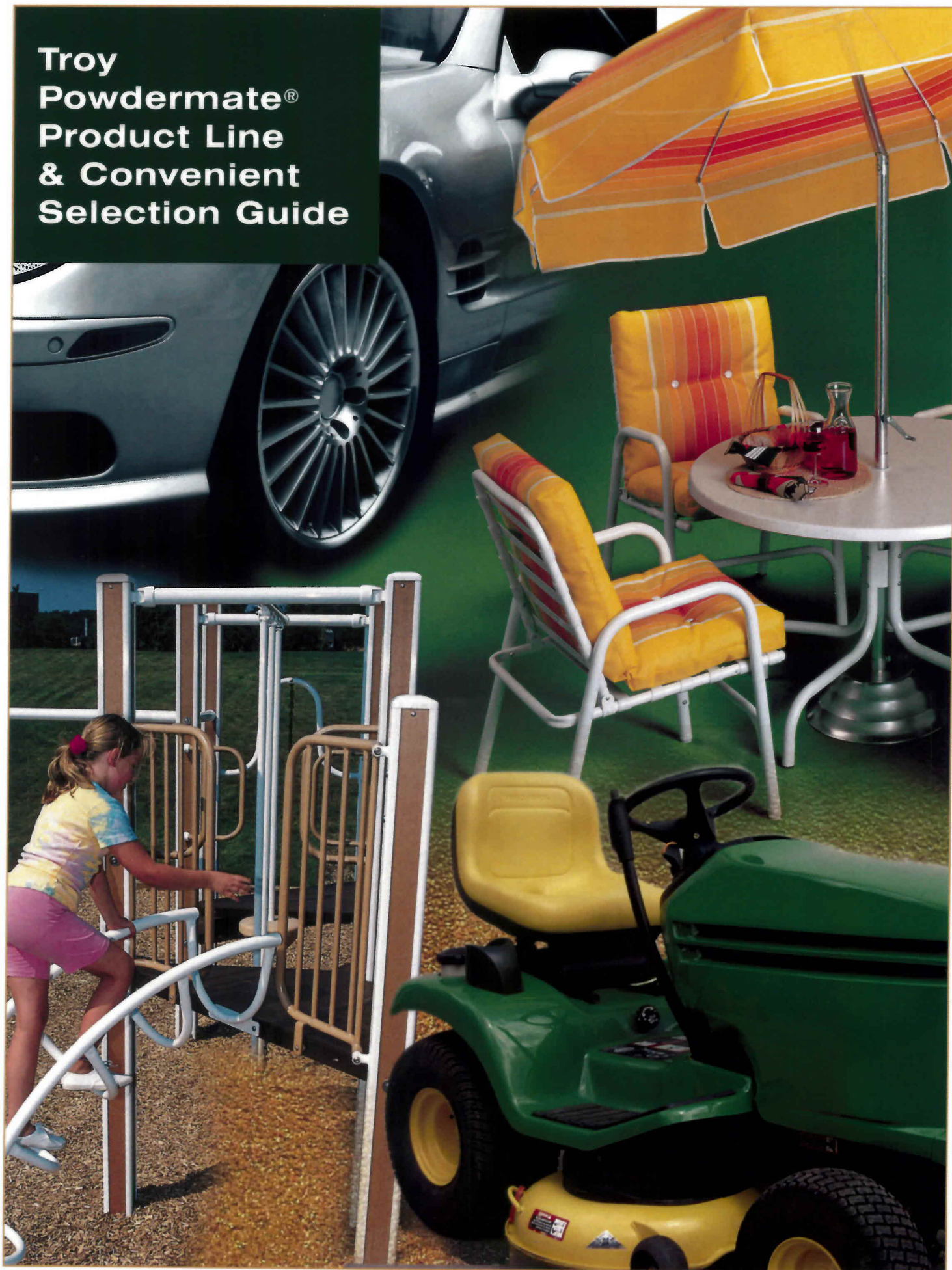
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The Gold Standard for Performance

**Troy
Powdermate®
Product Line
& Convenient
Selection Guide**





Technology for Superior Powder Coatings

The Forefront of Technology

Since its formation, Troy Powdermate has been a leader in technology development, investing significant resources in research and development to address emerging trends.

Powdermate's success in introducing innovative specialty additives in anticipation of industry needs has enabled powder coating manufacturers to reach new markets. Our technology advances have created products that are recognized for their excellent performance. Armed with the latest technology and next generation products, Powdermate additives are poised to lead the industry to a higher standard.

Where Powdermate Shines...

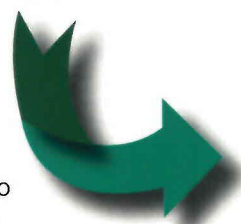
High performance results are what make Powdermate shine. Producing quality products with a proven track record in delivering results distinguishes Powdermate in a highly competitive market. Powdermate provides value added performance additives for:

- ✓ Flow & Leveling
- ✓ Degassing
- ✓ Texturing/Special Effects
- ✓ Pigment Wetting/Dispersing
- ✓ Substrate Wetting
- ✓ Color Development & Stability

Performance Partnership

An experienced Technical Service staff enables Troy to provide its customers with expert technical assistance to meet a diversity of challenges in producing high performance powder coatings. Troy is investing in materials research to create unique and innovative solutions for the customer. Troy is continually expanding its manufacturing capability for powder coating additives to deliver high quality materials in a timely way. Troy Powdermate supports its partners every step of the way through a global service network and local sales offices worldwide.

Powdermate Selection Guide



This selection guide is designed to match Troy Powdermate products with the most common application areas. Please contact a Troy representative for any application not covered.



Technology for

FLOW AND LEVELING				
PRODUCT	DESCRIPTION	USE LEVELS (%)	ACTIVE (%)	FEATURES
Powdermate® 486CFL	Amide-modified Polyether Oligomer	0.5 – 2.0	100	Excellent Clarity and Surface Smoothness
Powdermate 570FL	Amide-modified Polyether Oligomer	0.5 – 2.0	100	Excellent Clarity and Surface Smoothness with Intercoat Adhesion
Powdermate 575FL	Amido Ester Modified Polyether Oligomer	1.0 – 3.0	100	Excellent Clarity and Improved Surface Smoothness with Intercoat Adhesion
Powdermate 507PFL	Amide-modified Polymeric Ester	0.5 – 2.0	100	Excellent Surface Smoothness and Distinctness of Image (DOI)
DEGASSING				
Powdermate 542DG	Polymer-based Surfactant	0.5 – 2.0	100	Non-yellowing Degassing with Excellent Clarity
Powdermate 550DG	Amide-modified Phenol Surfactant	0.5 – 2.0	100	Non-yellowing Degassing
TEXTURING				
Powdermate 508TEX	Polymer-based Surfactant	0.5 – 2.0	100	Post-blend Texturing Additive with Excellent Consistency
PIGMENT WETTING				
Powdermate 520PWS	Polymer Based Surfactant	0.5 – 2.0	100	Excellent Pigment and Substrate Wetting



Superior Powder Coatings

PRODUCT	Incorporation			Coating Type			Resin Chemistries					
	Add to Premix	High Shear Premixing	Post-Blend	Clear Coatings	Pigmented Coatings	Textures	Epoxy	Polyester - TGIC	Polyester - Epoxy	Polyester - Primid®	Polyester - Urethane	Acrylic
FLOW AND LEVELING												
Powdermate® 486CFL	•	•		•	•		•	•	•	•	•	•
Powdermate 570FL	•	•		•	•		•	•	•	•	•	•
Powdermate 575FL	•			•	•		•	•	•	•	•	•
Powdermate 507PFL	•				•		•	•	•	•	•	•
DEGASSING												
Powdermate 542DG	•			•	•	•	•	•	•	•	•	•
Powdermate 550DG	•		•	•	•	•	•	•	•	•	•	•
TEXTURING												
Powdermate 508TEX			•			•	•	•	•	•	•	•
PIGMENT WETTING												
Powdermate 520PWS	•				•	•	•	•	•	•	•	•





Applications

	OEM	Automotive Body, Trim & Auxiliary	Clear Coat	Appliance	Architectural	Lawn & Garden	General Industrial	Functional
PRODUCT								
FLOW AND LEVELING								
Powdermate 486CFL	•	•	•	•	•	•	•	
Powdermate 570FL	•	•	•	•	•	•	•	
Powdermate 575FL	•	•	•		•			
Powdermate 507PFL	•	•	•	•	•	•	•	•
DEGASSING								
Powdermate 542DG	•	•	•	•	•	•	•	•
Powdermate 550DG	•	•	•	•	•	•	•	•
TEXTURING								
Powdermate 508TEX				•	•	•	•	
PIGMENT WETTING								
Powdermate 520PWS	•	•	•	•	•	•	•	•



POWDERMATE®



Technology for Superior Powder Coatings

Troy Corporation is dedicated to research and development and continual product innovation. Powdermate engineered products help formulators address the changing needs of the global market.



Member of

**Powder
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Institute**



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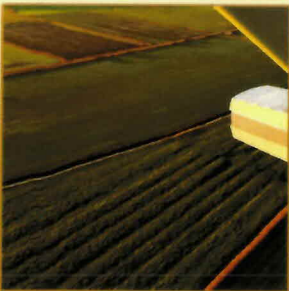
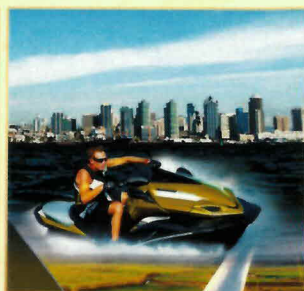
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Troycat™ Accelerators for Unsaturated Polyester Resins



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Troycat™ Accelerators

Polyester accelerators are widely used in the industry as an economical way to obtain desired properties in finished products such as fiberglass, automotive parts, underground storage tanks, and more.

The benefits of incorporating polyester accelerators are:

- Shorter gel times at both ambient & elevated temperatures
- Eliminate the need for heat assisted curing
- Improved clarity
- Better intrinsic strength
- Gel time drift suppression

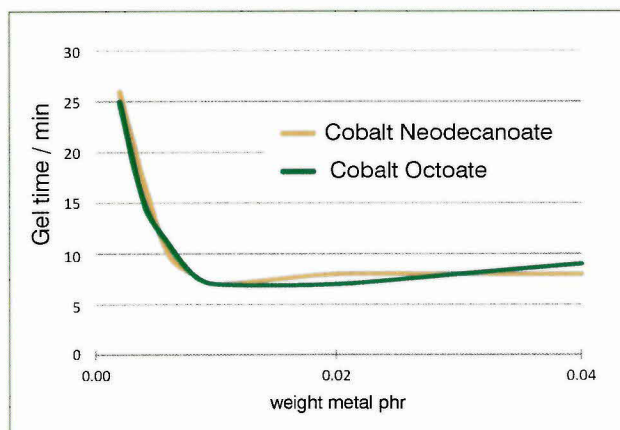
Troy Corporation, the global leader in preservatives, additives, and metal carboxylates, offers a wide range of accelerators for the curing of unsaturated polyester resin (UPR), vinyl ester, and methacrylate resins, which cure by the addition of peroxides. The extensive Troycat line of accelerators offers effective performance, low cost-in-use, and compatibility with a wide range of resin systems. With a comprehensive line of Troycat products, Troy offers a solution to your needs and objectives.

Types of Accelerators

Cobalt Primary Accelerators

Cobalt accelerates the decomposition of organic peroxide initiators (catalysts) to produce free radicals that initiate and promote the cross-linking of polyester resins. This acceleration significantly reduces gel time even at ambient temperature, as can be seen in Figure 1.

Figure 1



Co-Accelerators / Curing Enhancers

Co-accelerators offer several benefits, including a reduced tendency for gel time drift, as well as improved clarity, translucency, and color control in the finished products.



UPR Synthesis

Lithium acts as an alcoholysis and trans-esterification catalyst. Troymax™ Lithium 2 is a high-performance esterification catalyst used in the synthesis of unsaturated polyester resins. Troymax Lithium 2 is a low toxicity product that enables manufacturers to produce resins of significantly lighter color, while allowing for better molecular weight control and improved product viscosities.

Troycat Accelerators

Troycat Cobalt 6, 8, 10, & 12
Troycat Cobalt NEO 10 & 12
Troycat Manganese 6, 10, & 12
Troycat Potassium 10 & 15
Troycat Calcium 10
Troycat Copper 8
Troycat Zinc 8, 16, & 18
Troycat Strontium 10
Troycat Cobalt 21 NEO
Troycat KC10 (Cobalt Blend)
Troycat NPC (Non-pinking Cobalt)
Troycat 350
Troycat BXPB
Troycat BXCO
Troycat Permadyr (Gel-time Drift Suppressant)

Figure 2

Troycat™ NPC Non-Pinking Cobalt Accelerator

Typical cobalt carboxylates are known to leave a residual pink hue (green in some systems) in the end product. To address this need, Troy developed Troycat NPC, an innovative cobalt accelerator that does not discolor clear casting resins.

Troycat NPC was evaluated in typical, commercially available clear casting composite UPRs catalyzed using Methyl Ethyl Ketone Peroxide. Troycat NPC did not discolor the resin, while still producing short gel times under ambient conditions. Standard Cobalt, however, imparted a noticeable pink hue (see Figure 2).

Troycat NPC Does Not Impart Unwanted Color



Troycat NPC
Use level = 0.20 phr*
Gel-time = 8 min

Regular Cobalt 12% Accelerator
Use level = 0.10 phr
Gel-time = 8 min

Primary Accelerators

Cobalt	Troycat Cobalt 6, 8, 10 & 12	
Manganese	Troycat Manganese 6, 10 & 12	
Cobalt Blends	Troycat KC10 Troycat NPC	Reduced promoter cost
		Lighter-colored resins
		Reduced pinking, or non-pinking
		Reduced gel-time drift tendency
Cobalt Alternatives	Troycat BXCO Troycat Manganese + Troycat 350	

Gel-Time Drift Suppressant

Troycat Cobalt 21 NEO • Troycat Permadyr • Troycat BXPB	A reduction of up to 40% in gel time is sometimes realized.
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Co-Accelerators / Curing Enhancers

Potassium	Troycat Potassium 10 Troycat Potassium 15	Potassium is used in conjunction with Cobalt for a synergistic effect and is particularly well-suited for light-colored polyesters. Potassium reduces discoloration from cobalt in the final gel-coat. The addition of 0.01-0.50 phr enables the user to reduce the amount of cobalt required, thereby obtaining lighter-colored resins and cost savings.
Zinc	Troycat Zinc 8 Troycat Zinc 16 Troycat Zinc 18	Offers better clarity in the finished resins
Copper	Troycat Copper 8	Extends shelf-life to pre-promoted resins
		Lowens the peak exotherm of the formulation
Copper	Troycat Copper 8	On large polyester castings, surface cracks or irregularities can occur from an excessive peak exotherm. As little as 0.01 phr to 0.10 phr of Troycat Copper 8 can alleviate surface problems, such as brittleness and cracking.
Calcium	Troycat Calcium 10	Calcium is used for color control within resins.

UPR Synthesis

Lithium	Troycat Lithium 2	Used for polyester production via a transesterification/ alcoholysis process. Troymax Lithium 2 is active immediately upon incorporation. Lithium 2 is a liquid, which makes it easy to handle and incorporate. Residual lithium in the end product does not inhibit the cure.
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Services

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Troy invites you to take advantage of the Troy services that can help you achieve your market objectives.

- Technical Service representatives can provide formulation assistance, product evaluation, and microbiological, analytical, and field testing to assist you in developing an optimum formulation that meets your product objective.
- Regulatory support is offered globally with regional and national expertise to meet your needs.
- R&D scientists constantly work to anticipate future industry needs and develop innovative technology. Contact your Troy representative to discuss your unique requirement that may not be met by materials currently on the market. In fact, Troy may have just what you need already under development and if not, may be able to work with you to achieve your objective.
- A global supply network is in place to ensure product availability and fast delivery. Contact your local representative to ensure the product you need is available when you need it.

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Paint & Ink Driers

Troymax™
Troychem™



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Paint & Ink Driers Selection Guide



Element	Symbol	Typical use level % metal per resin solids	Description
Barium	Ba	0.20	Barium carboxylates improve through-drying of a coating and have good pigment wetting characteristics. They also demonstrate lower water sensitivity than Calcium carboxylates.
Bismuth	Bi	0.20	Bismuth is used as a substitute for lead. It strongly activates cobalt and improves through-drying properties and drying under adverse weather conditions (like Calcium does). Bismuth carboxylates are used in baking finishes to improve the hardness.
Calcium	Ca	0.20	Calcium carboxylates, by themselves, have minimal effectiveness as driers but are very useful when used in combination with active driers such as Cobalt and Manganese. Calcium driers help to improve hardness and gloss as well as to reduce skin-formation, silking, and blooming. They are also useful as pigment wetting/dispersing agents and loss-of-dry inhibitors. Calcium carboxylates are not recommended for coatings subjected to drying under adverse conditions.
Cobalt	Co	0.04	Cobalt carboxylates are the most effective oxidative catalysts at ambient temperatures. Cobalt driers produce fast surface dry to the film. They also are effective as accelerators for peroxide-initiated polyesters and epoxies.
Copper	Cu	0.15	Copper carboxylates possess some catalytic activity and tend to produce more consistent films.
Iron	Fe	0.06	Effective drying catalyst for baking finishes.
Lithium	Li	0.08	Lithium carboxylates promote through-drying. They are often used in High Solids coatings and water-dispersible alkyds. They do not lose their effectiveness even in cool environments.
Manganese	Mn	0.04	Manganese carboxylates improve the surface drying of a paint film and also possess some through-drying properties. They are frequently used as polymerization accelerators in baking finishes and low-temperature drying systems.
Potassium	K	0.10	Potassium carboxylates work synergistically with Cobalt in thermo-set systems.
Strontium	Sr	0.20	Strontium carboxylates improve through-drying under adverse conditions, such as high humidity and low temperatures.
Zinc	Zn	0.15	Zinc carboxylates demonstrate anti-oxidant properties. Zinc carboxylates keep auto-oxidative films "open," thus permitting hardening throughout. Zinc carboxylates are very effective wetting/pigment-dispersing agents.
Zirconium	Zr	0.20	Zirconium carboxylates improve the through-dry of auto-oxidative drying systems. They are used in combination with Cobalt and Calcium carboxylates. They are preferentially used as replacements for Lead.

Products

Function	Product
Carboxylates from Synthetic Acids	Troymax™ Barium 12.5
	Troymax Bismuth 24
	Troymax Calcium 10NA
	8NA
	6NA
	5NA
	4NA
	Troymax Calcium Octoate 6
	5
	Troymax Cobalt 12
	12 NEO
	10
	10 NEO
	8
	6
	Troymax Lithium 2
	Troymax Manganese 12
	10
	9
	6
	Troymax Potassium 15
	Troymax Strontium 10
	Troymax Zinc 16
	12
	10
	8
	Troymax Zirconium 24
	18
	12
	10
	6
Cobalt-Free Primary Drier	Troymax BXCO
Naphthenates	Troychem Copper 8
	Troychem Zinc 8
	Troychem Iron 6
Loss of Dry Inhibitor	Troymax Perma Dry
Water Dispersible	Troychem Calcium 6WD
	Troychem Cobalt 6WD
	Troychem Manganese 6WD
	Troychem Zirconium 12WD
	Troymax Lithium 2
Non-Metallic Driers	Troymax 350
Standard Drier Blends	Troymax CZ69
	Troymax CSD
	Troymax 123
	Troymax 2002
	Troymax KC10
	Troymax BXPB
Custom made Drier Blends can also be provided.	

Use Levels

Vehicle or Type	Cobalt	Maganese	Zirconium	Calcium
ALKYDS Expressed as % metal on vehicle solids				
Long Oil Soya	.03 - .06	-	0.1 - 0.3	-
	.03 - .06	-	0.1 - 0.2	0.1 - 0.2
	.03 - .06	-	-	0.1 - 0.3
Medium Oil Soya	.02 - .04	-	0.05 - 0.1	0.05 - 0.1
	.02 - .04	-	0.1 - 0.2	-
Short Oil Soya	.01 - .03	-	0.05 - 0.1	-
	.01 - .03	-	-	0.05 - 0.1
	.01 - .03	-	0.05 - .01	0.05 - 0.1
Long Oil Linseed	.03 - .05	-	0.1 - 0.3	-
	.03 - .05	-	-	0.1 - 0.3
	.03 - .05	-	0.1 - 0.2	0.1 - 0.2
Medium Oil Linseed	.02 - .04	-	0.1 - 0.2	-
	.02 - .04	-	-	0.1 - 0.2
Long Oil (Others)	.03 - .06	-	0.1 - 0.3	0.1 - 0.3
	.03 - .06	-	-	-
Short Oil (Castor)	.01 - .03	-	0.1 - 0.2	0.1 - 0.2
	.01 - .03	-	-	-
Short Oil (Tall)	.01 - .03	-	0.1 - 0.2	-
	.01 - .03	-	-	0.1 - 0.2
OILS				
Linseed	-	.02 - .03	0.1 - 0.2	0.1 - 0.2
Raw	.02 - .03	-	0.1 - 0.2	0.1 - 0.2
Boiled	.01 - .02	.01 - .02	0.1 - 0.3	-
Alkali Refined	-	.02 - .03	0.1 - 0.2	-
Heat Bodied	.02 - .03	-	0.1 - 0.3	-
Soybean Raw	0.1 - 0.2	0.1 - .02	0.1 - 0.3	-
Heat Bodied	.05 - .1	.05 - 0.1	0.1 - 0.3	-
Calculation Example, 45 kg, resin at 50% solids = 22.5 kg resin solids. To incorporate 0.04% Cobalt on resin solids: 22.5 kg x 0.04% = 0.009 kg of Cobalt is required. This is provided by $\frac{0.009 \times 100}{12} = 0.075$ kg of Troymax Cobalt 12				

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Performance Additives

FOR COATINGS



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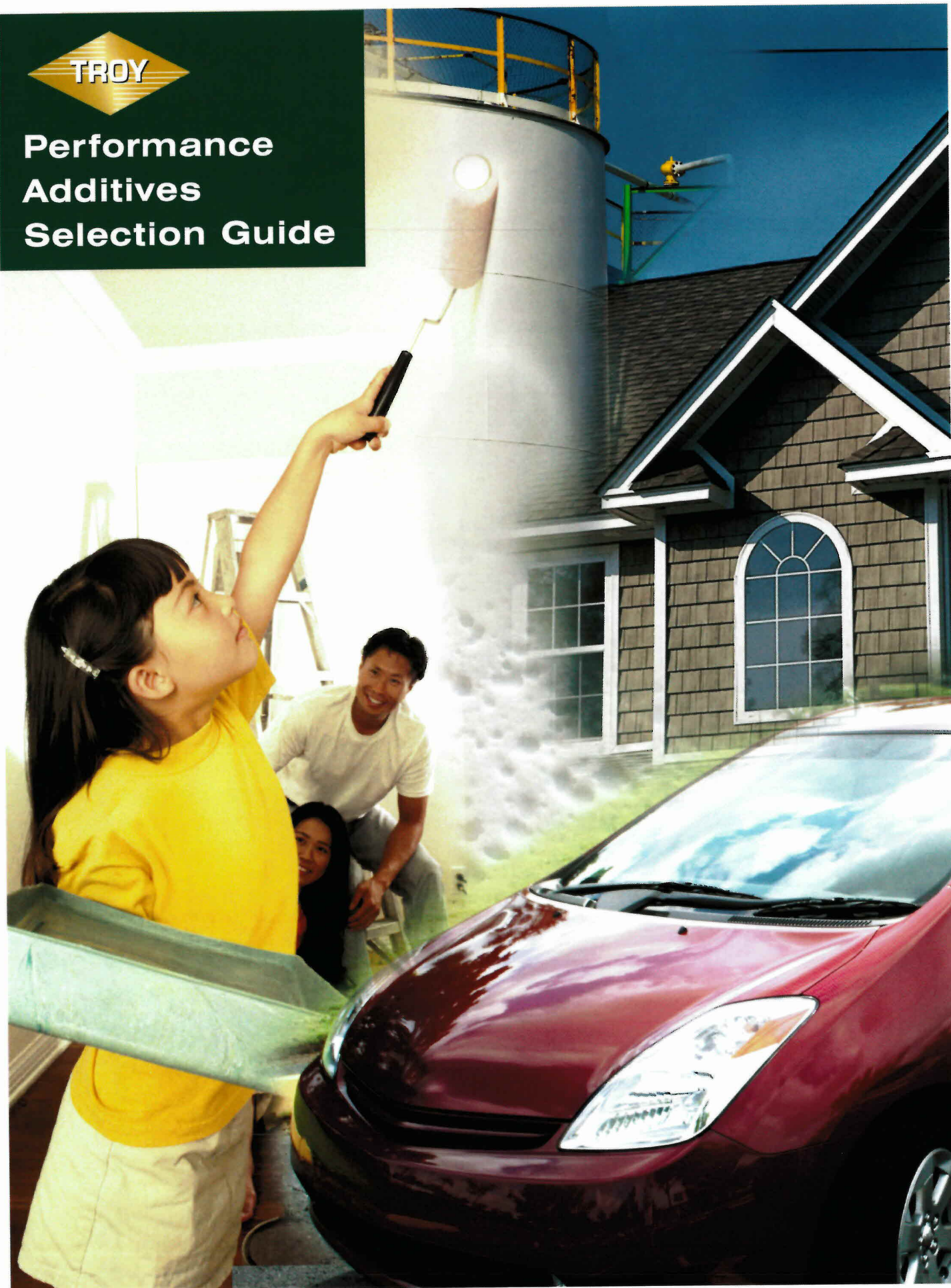


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Performance Additives Selection Guide



Troy Performance Additives Enhance Coating Properties

Troy Performance Additives enable coatings manufacturers to develop formulated products that meet the demanding requirements of their customers. Troy Performance Additives include wetting additives, which promote surface wetting and enhance coating appearance; dispersing additives, which improve pigment dispersion; rheological additives, which improve application, reduce pigment settling, and provide resistance to sagging; and defoaming additives, which improve air release during production and application.

Technical service assistance is located in strategic worldwide locations to provide solutions to customer challenges and assist in the use of additives for new product development. Additionally, Troy's website, www.troycorp.com, offers registered visitors instant access to information on Performance Additive products, including TDSs, MSDSs, and industry and product brochures.

Wetting Additives	Dispersing Additives	Defoaming Additives	Rheological Additives
<ul style="list-style-type: none">✓ Improve substrate wetting✓ Improve adhesion✓ Improve surface smoothness✓ Improve gloss✓ Improve color acceptance and uniformity✓ Improve surface slip✓ Eliminate surface defects	<ul style="list-style-type: none">✓ Improve hiding and color strength✓ Reduce dispersion processing time✓ Improve color uniformity✓ Increase transparency for transparent pigments✓ Improve gloss	<ul style="list-style-type: none">✓ Eliminate process foam✓ Eliminate application foam	<ul style="list-style-type: none">✓ Develop viscosity profile✓ Improve application properties✓ Reduce pigment settling✓ Reduce coating sag✓ Improve color uniformity

This selection guide is designed to inform customers of the performance additives Troy currently offers, and to assist them in selecting products that will best serve their needs. Contact a Troy representative for further assistance, or visit www.troycorp.com for more information.

Additives Selection Guide



Product	Uses	Applicable Systems	Features
WETTING ADDITIVES			
Troysol™ AFP	Color float	Aqueous/non-aqueous	Prevents floating and flooding
Troysol™ LAC	Substrate wetting/flow and leveling	Aqueous	Superior substrate wetting
Troysol™ ZLAC	Substrate wetting/flow and leveling	Aqueous	No VOC/superior substrate wetting
Troysol™ S367	Substrate wetting/flow and leveling	Non-aqueous	Wets contaminated substrate, APE-free
Troysol™ Z370	Substrate wetting/flow/slip/anti-mar	Aqueous/non-aqueous	Universal, no VOC contribution
Troysol™ Z377	Substrate wetting/flow and leveling	Non-aqueous	Low VOC/superior surface flow & leveling
Troysol™ 380W	Substrate wetting/flow and leveling	Aqueous	Reduces surface tension
Troysol™ 382	Substrate wetting/flow and leveling	Aqueous	Effective wetting in high speed applications
Troysol™ MS2	Surface slip/anti-mar	Aqueous/non-aqueous	Anti-mar/slip efficacy with excellent recoatability
Troysol™ PWA	Substrate wetting	Dry	Improved adhesion to substrates
DEFOAMING ADDITIVES			
Troykyd® D11	PSAs, adhesives	Aqueous	Silicone free, easily dispersible
Troykyd® D121	Air release	Dry	Dry powders
Troykyd® D209W	Micro/macro foam	Aqueous	Highly compatible
Troykyd® D230	Process	Aqueous	Effective in color concentrates, FDA approval
Troykyd® D472	General purpose	Aqueous	Highly effective in high pH systems
Troykyd® D704	General purpose	Aqueous	High efficacy, excellent persistence
Troykyd® D720	General purpose	Aqueous	100% active, water-dispersible
Troykyd® D726	General purpose	Aqueous	Wide compatibility/excellent persistence
Troykyd® D727	Performance/semi-gloss	Aqueous	Silicone-free/ease of incorporation
Troykyd® D729	Process	Aqueous	Strong process defoamer
Troykyd® D742	Performance/high-gloss	Aqueous	Highly effective, excellent persistence
Troykyd® D745	Performance/high-gloss	Aqueous	Highly effective, excellent persistence
Troykyd® D777	General purpose	Aqueous	Highly effective in viscous systems
Troysol™ AFL	Air release	Non-aqueous	Highly effective in solvent systems
Troysol™ 307	Air release	Non-aqueous	Contains silicone
DISPERSING ADDITIVES			
Troysperse™ CD1	Pigment dispersion	Non-aqueous	Excellent pigment dispersion & stabilization
Troysperse™ 98C	Pigment dispersion	Non-aqueous	Effective with carbon black, iron oxides, and organics
Troysperse™ W	Pigment dispersion	Aqueous/non-aqueous	Effective for color concentrates
Troysperse™ ZWD1	Pigment dispersion	Aqueous	Low use level, organic & carbon black
Troysperse™ ZWD3	Pigment dispersion	Aqueous	Highly efficient, carbon black
Troysperse™ 90W*	Pigment dispersion	Aqueous/non-aqueous	Excellent for universal color concentrates
RHEOLOGY MODIFIERS			
Troythix® XYZ	Viscosity/sag/settling	Non-aqueous	Imparts thixotropic properties
Troythix® A	Viscosity/sag/settling	Non-aqueous	Excellent for architectural coatings
Troythix® 42BA	Viscosity	Non-aqueous	Viscosity adjustments for oxidizing systems
Troythix® AntiSag 4	Sag/settling	Non-aqueous	Post-add to reduce sag
Troythix® 150ACS	Viscosity/sag/settling	Non-aqueous	Excellent pigment suspension
Troythix® 152H	Viscosity/sag/settling	Non-aqueous	High viscosity, excellent pigment suspension
Troythix® 154B	Viscosity/sag/settling	Non-aqueous	Aromatic-free
Troythix® 156P	Viscosity/sag/settling	Non-aqueous	100% active powder
Troythix® 704SSA	Settling	Aqueous/non-aqueous	Prevents pigment settling in aerosol coatings & stains
Troythix® 707SSA	Settling	Aqueous/non-aqueous	Prevents pigment settling in aerosol coatings & stains

Use Levels (% Weight)	Physical Form	Description	Incorporation	Product
WETTING ADDITIVES				
0.2 - 0.6	Powder	Surface-treated inert carrier	Grind	Troysol™ AFP
0.1 - 0.8	Liquid	Anionic surfactant	Let down, post-add	Troysol™ LAC
0.1 - 0.8	Liquid	Anionic surfactant	Let down, post-add	Troysol™ ZLAC
0.2 - 0.6	Liquid	Siloxane co-polymer	Let down, post-add	Troysol™ S367
0.1 - 0.5	Liquid	Siloxane co-polymer	Let down, post-add	Troysol™ Z370
0.1 - 0.5	Liquid	Acrylic	Let down, post-add	Troysol™ Z377
0.2 - 0.6	Liquid	Siloxane polyalkylene co-polymer	Let down, post-add	Troysol™ 380W
0.1 - 0.5	Liquid	Diol solution	Let down, post-add	Troysol™ 382
0.1 - 0.4	Liquid	Non-ionic surfactant oligomers	Let down, post-add	Troysol™ MS2
0.3 - 2.0	Powder	Surface-treated inert carrier	Dry blend	Troysol™ PWA
DEFOAMING ADDITIVES				
0.2 - 0.5	Liquid	Hydrophobic silica	Grind, let down	Troykyd® D11
0.1 - 0.4	Powder	Glycol-treated carbonate	Dry blend	Troykyd® D121
0.2 - 1.0	Liquid	Silicone emulsion	Grind, let down	Troykyd® D209W
0.05 - 0.3	Liquid	Hydrophobic silica/silicone	Grind	Troykyd® D235
0.4 - 0.8	Liquid	Glycol/surfactant blend	Grind, let down	Troykyd® D472
0.2 - 1.0	Liquid	Hydrophobic silica	Grind, let down	Troykyd® D704
0.2 - 1.0	Liquid	Synthetic wax	Grind, let down	Troykyd® D720
0.2 - 1.0	Liquid	Hydrophobic silica/synthetic wax	Grind, let down	Troykyd® D726
0.2 - 1.0	Liquid	Hydrophobic silica	Grind, let down	Troykyd® D727
0.05 - 0.3	Liquid	Hydrophobic silica/silicone	Grind, let down	Troykyd® D729
0.1 - 0.6	Liquid	Blend of modified silicones and polyglycols	Grind, let down	Troykyd® D742
0.1 - 0.6	Liquid	Blend of modified silicones	Grind, let down	Troykyd® D745
0.2 - 0.5	Liquid	Silicone modified glycol ester	Grind, let down	Troykyd® D777
0.2 - 0.6	Liquid	Polymeric ester blend	Grind, let down	Troysol™ AFL
0.2 - 0.6	Liquid	Non-ionic polymeric surfactant/silicone co-polymer	Grind, let down	Troysol™ 307
DISPERSING ADDITIVES				
Varies	Liquid	Derivative of polymerized oils	Grind	Troysperse™ CD1
Varies	Liquid	Fatty amine surfactant	Grind	Troysperse™ 98C
Varies	Liquid	Amphoteric dispersant	Grind	Troysperse™ W
Varies	Liquid	Non-ionic dispersant	Grind	Troysperse™ ZWD1
0.2 - 0.6	Liquid	Surface treated carrier	Grind, Let-down, post-add	Troysperse™ ZWD3
Varies	Liquid	Anionic dispersant	Grind	Troysperse™ 90W
RHEOLOGY MODIFIERS				
0.2 - 1.0	Powder	Castor oil ester	Grind	Troythix® XYZ
0.2 - 1.0	Powder	Modified castor oil ester	Grind	Troythix® A
0.5 - 1.5	Liquid	Chemically modified polymerized oil	Let down, post-add	Troythix® 42BA
0.4 - 1.0	Liquid	Sulphonated castor oil	Let down, post-add	Troythix® AntiSag 4
0.5 - 5.0	Paste	Polyamide wax	Incorporate with shear	Troythix® 150ACS
0.5 - 5.0	Paste	Polyamide wax	Incorporate with shear	Troythix® 152H
0.5 - 5.0	Paste	Polyamide wax	Incorporate with shear	Troythix® 154B
0.2 - 2.0	Powder	Polyamide wax	Grind, heat activation	Troythix® 156P
0.5 - 1.5	Powder	Surfactant silica	Grind	Troythix® 704SSA
0.5 - 1.5	Powder	Surfactant silica	Grind	Troythix® 707SSA

Suggested Application Systems	Product	Non-Aqueous														Aqueous											
		Dry		Alkyd		Acrylic		Epoxy		Urethane		Polyester		Lacquers		Water Reducible		Emulsion									
		Dry Powder	Air-Drying	Baking	Air-Drying	Baking	2-Component	Epoxy Ester	Epoxy-Phenolic	2-Component	Oil-Modified	Moisture-Curing	Saturated	Unsaturated	Nitrocellulose	Butyrate	Vinyl	Chlorinated Rubber	Alkyd	Acrylic	Polyester	Pure Acrylic	Modified Acrylic	Vinyl Acetate/Ethylene	Urethane (PUD)	Alkyd	
WETTING ADDITIVES																											
	Troysol™ AFP		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troysol™ LAC																										
	Troysol™ ZLAC																										
	Troysol™ S367		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troysol™ Z370		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troysol™ Z377		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troysol™ 380W																										
	Troysol™ 382																										
	Troysol™ MS2		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troysol™ PWA	•																									
DEFOAMING ADDITIVES																											
	Troykyd® D11																										
	Troykyd® D121	•																									
	Troykyd® D209W																										
	Troykyd® D230																										
	Troykyd® D472																										
	Troykyd® D704																										
	Troykyd® D720																										
	Troykyd® D726																										
	Troykyd® D727																										
	Troykyd® D729																										
	Troykyd® D742																										
	Troykyd® D745																										
	Troykyd® D777																										
	Troysol™ AFL		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troysol™ 307		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
DISPERSING ADDITIVES																											
	Troysperse™ CD1		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troysperse™ 98C		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troysperse™ W																										
	Troysperse™ ZWD1																										
	Troysperse™ ZWD3																										
	Troysperse™ 90W		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
RHEOLOGY MODIFIERS																											
	Troythix® XYZ		•		•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troythix® A		•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troythix® 21BA		•		•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troythix® 42BA		•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troythix® AntiSag 4		•		•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troythix® 150ACS		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troythix® 152H		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troythix® 154B		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troythix® 156P		•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troythix® 250XF		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troythix® 704SSA		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Troythix® 707SSA		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	

Notes

Services

As a Performance Partner, Troy offers a variety of services to support our product line of preservatives and additives to meet customer needs and provide market solutions.

Troy invites you to take advantage of the Troy services that can help you achieve your market objectives.

- Technical Service representatives can provide formulation assistance, product evaluation, and microbiological, analytical, and field testing to assist you in developing an optimum formulation that meets your product objective.
- Regulatory support is offered globally with regional and national expertise to meet your needs.
- R&D scientists constantly work to anticipate future industry needs and develop innovative technology. Contact your Troy representative to discuss your unique requirement that may not be met by materials currently on the market. In fact, Troy may have just what you need already under development and if not, may be able to work with you to achieve your objective.
- A global supply network is in place to ensure product availability and fast delivery. Contact your local representative to ensure the product you need is available when you need it.

Call your nearest Troy representative for immediate assistance or visit us online at www.troycorp.com. When visiting the website, become a registered user to obtain access to a wide range of resources.

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The Gold Standard for Performance

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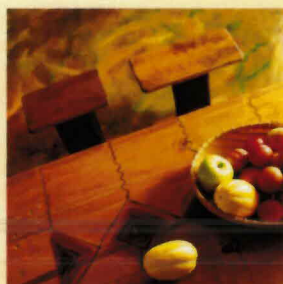
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Performance Additives

FOR THE WOOD & FURNITURE FINISH INDUSTRY



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page



The Gold Standard for Performance

C ontents



Introduction

Wetting

Rheology

Dispersion

Defoaming

In-Can Stability

Specialty Surface Additives

Sample Formulations

I ntroduction

The wood and furniture finishes industries have demanding requirements for the coatings they consume. Prominent among the qualities required are aesthetics and durability. Troy provides additive products that enhance the performance of these coatings by improving wetting and adhesion, appearance, and application properties. Troy additives enable coatings manufacturers to supply products that meet these demanding requirements of the wood and furniture finishes industry.

Coating Systems

There are three general classifications of wood and furniture finishes:

- Sealers
- Topcoats
- Multi-Layer Systems

Sealers are the protective coats that make direct contact with the wood substrate. Topcoats are the subsequent layers added on top of the sealer, which play both protective and decorative roles. Alternatively, some manufacturers apply multi-layer systems, which function as both sealers and topcoats.

Troy produces additives for use in the three principle formulation types, which are:

- Non-Aqueous
- UV-Cured
- Aqueous

Finishes can be pigmented or clear and can have a variety of surface appearances (e.g., flat or glossy) to serve different purposes. The three primary methods of finish application are spraying, curtain coating, and roller coating. Wood and furniture finishes are applied not only to solid wood and veneers, but also to plastic, metal, paper, foil, chipboard, and medium density fiberboard (MDF).

Introduction

Binder Systems

When formulating wood and furniture finishes, nitrocellulose (NC), acid catalyzed (AC), polyurethane (PU), unsaturated polyester (UP), light sensitive monomers, and vinyl acrylates are used. To enhance the final properties of the coating, these systems can be modified with non-convertible binders, such as NC, cellulose acetate butyrate (CAB), and vinyl chloride/vinyl acetate copolymers.

Troy additives suit a wide range of these binder systems, and span six general additive types (see Table 1). Within each of these six main types are Troy additives designed for non-aqueous, UV-cured, and aqueous systems. Most Troy additives perform in both pigmented and clear coatings and offer excellent compatibility, with enhanced coating properties at low use levels.

Table 1

Additive Class	Function
Wetting	Substrate Wetting Color Acceptance, Floating & Flooding Surface Slip & Mar Resistance Surface Smoothness, Flow & Leveling Pigment Orientation Air-Draft Sensitivity
Rheology	Anti-Sagging Anti-Settling Viscosity Increase
Dispersing	Pigment Wetting Flooding & Floating
Defoaming	Air Release Bubble Break
In-Can Stability	Bacterial Control Anti-Skinning
Surface Appearance	Drying Matting & Sanding

Wetting

Troy produces wetting additives for a wide range of functions (Table 2). For instance, Troy wetting additives are incorporated to provide improved substrate wetting, which results in better adhesion. They also promote surface flow, which provides coating films that are free of surface defects, such as fisheyes, craters, and orange peel. Troy surface slip additives provide scratch and mar resistance and improve resistance to blocking. Troy wetting additives provide improved resistance to color floating and flooding, and control the orientation of flatting and special effects pigments. Furthermore, they reduce coating air-draft sensitivity encountered during forced dry curing conditions.

Wetting Additive Recommendations

Table 2

Function	System Type		
	Non-Aqueous	UV-Cured	Aqueous
Substrate Wetting	Troysol™ S366 Troysol S367	Troysol S366 Troysol S367	Troysol LAC Troysol 380W
Color Acceptance, Floating & Flooding	Troysperse™ CD1 Troysperse SD100 Troysperse 98C Troysol AFP Troysperse 200SF Troysol S366 Troysol S367	Troysperse 98C Troysol AFP Troysperse 200SF Troysol S366 Troysol S367	Troysol LAC Troysol 380W Troysperse W Troysperse 90W
Surface Slip & Mar Resistance	Troysol MS2	Troysol MS2	Troysol MS2
Surface Smoothness	Troysol S366 Troysol S367 Troysol MS2	Troysol S366 Troysol S367 Troysol MS2	Troysol LAC Troysol 380W
Pigment Orientation	Troysol S366 Troysol S367	Troysol S366 Troysol S367	Troysol LAC Troysol 380W
Air-Draft Sensitivity	Troysol S366 Troysol S367	Troysol S366 Troysol S367	

Substrate Wetting

The use of Troy performance wetting additives reduces the surface tension of the coatings and allows the application of defect-free films (Exhibit 1). Troysol™ S366 and S367 are extremely effective for non-aqueous and UV-cured systems applied to furniture components made from low energy materials, such as plastics and metal components, on which the presence of oil and/or silicone contaminants is common.

Troysol LAC provides improved adhesion in aqueous coating systems by promoting complete substrate wetting (Exhibit 2). In aqueous systems formulated to meet low volatile organic compounds (VOC) requirements, difficulties in substrate wetting are encountered when a conventional additive is incorporated. However, the strong surface tension reduction imparted by the addition of Troysol LAC enhances coating performance in the absence solvent.

Exhibit 1

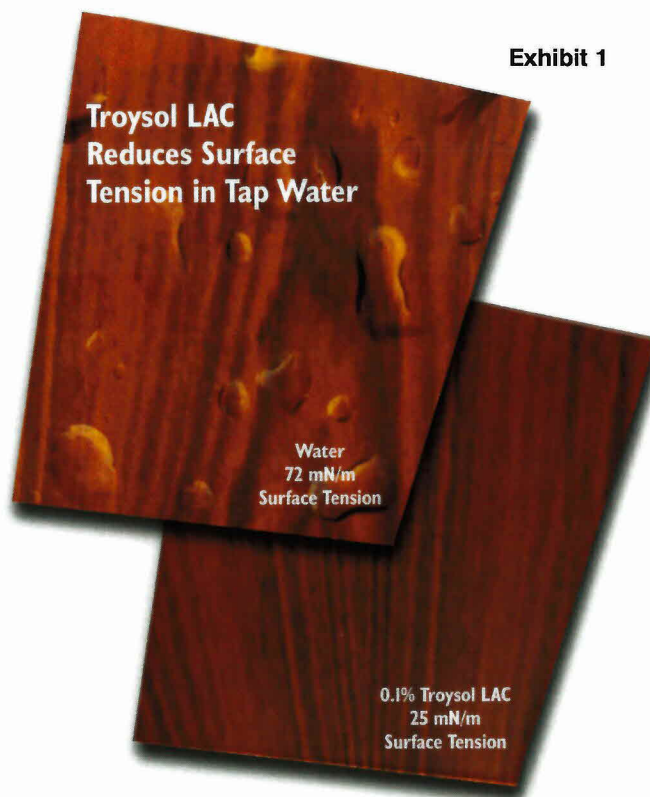
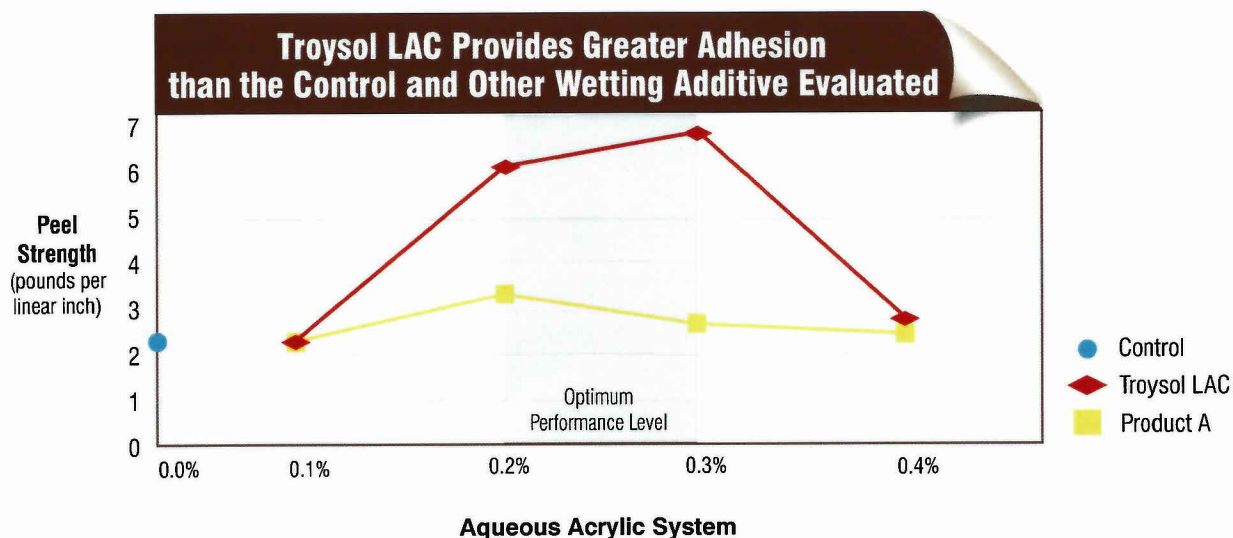


Exhibit 2



Color Acceptance, Floating, & Flooding

The use of Troysol™ wetting additives improves the color acceptance of base coatings that are custom tinted to selected colors. The wetting additives supplement the pigment dispersant and help avoid the conditions of floating and flooding. This is particularly important in multiple pigment colors.

The incorporation of Troysol AFP in the base coating formulation provides excellent color acceptance. Troysol S366 and S367 for non-aqueous and UV-cured systems and Troysol LAC for aqueous systems can be post-added to coatings in which color acceptance problems are encountered.

Surface Slip and Mar Resistance

Surface slip and mar resistance can be improved in non-aqueous, UV-cured, and aqueous coatings using Troysol MS2. Troysol MS2 provides surface slip without affecting intercoat adhesion.

For the highest degree of gloss, distinctness of image (DOI), and surface smoothness, a combination of Troysol S366 and MS2 is used. In aqueous coatings in which intercoat adhesion is not required, the use of Troysol MS2 with a wax additive provides excellent results (Exhibit 3; Formulation 2, page 9).

Surface Smoothness

Troysol S366 and S367 promote surface flow and leveling resulting in non-aqueous and UV-cured coating films with excellent surface smoothness (Formulation 4, Page 10). Coatings containing these wetting additives provide high gloss and DOI with excellent clarity (Exhibit 4).

In aqueous systems, Troysol LAC acts as a multi-functional additive allowing the formulation of coatings with exceptional surface smoothness, high gloss, and high DOI.

Exhibit 3

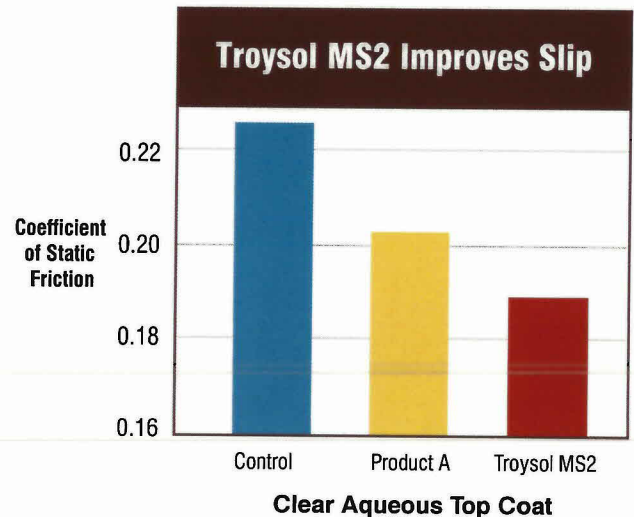
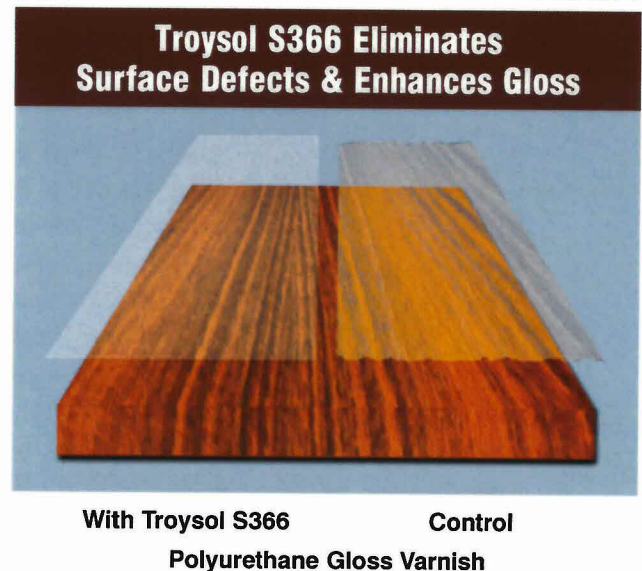


Exhibit 4



Pigment Orientation

Troysol wetting additives can be incorporated into matte or low gloss finishes to help with the orientation of matting pigments. Troysol 366 & 367 reduce the surface tension allowing the matting pigments mobility to orient uniformly at the coating surface.

Air Draft Sensitivity

Troysol S366 and S367 correct the problem of air draft sensitivity by reducing the surface tension of the coating.

Rheology Additive Recommendations

Table 3

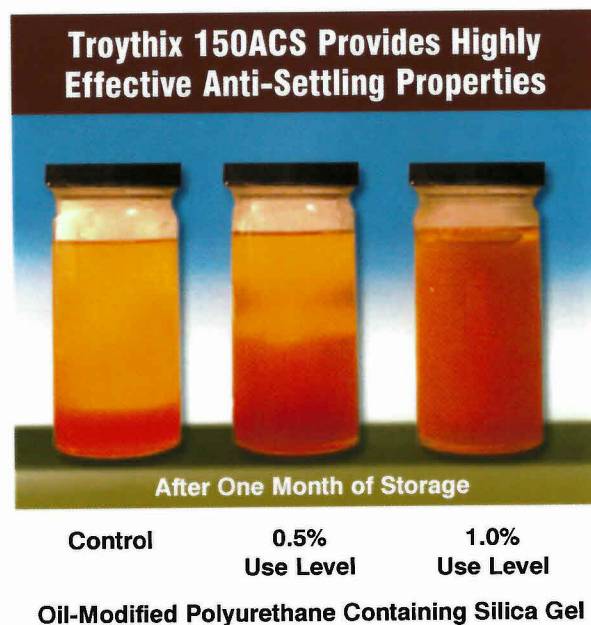
Function	System Type	
	Non-Aqueous	UV-Cured
Anti-Sagging	Troythix* 150ACS Troythix 250XF Troythix A Troythix AntiSag 4	Troythix 150ACS Troythix 250XF Troythix A
Anti-Settling	Troythix 150ACS Troythix 250XF Troythix A Troythix 704SSA Troythix 707SSA	Troythix 150ACS Troythix 250XF Troythix A Troythix 704SSA Troythix 707SSA
Viscosity Increase	Troythix 150ACS Troythix 250XF Troythix A Troythix 42BA	Troythix 150ACS Troythix 250XF Troythix A

Troy provides a range of rheology additives for non-aqueous and UV-cured coatings (Table 3). Troythix A, 150ACS, and 250XF are additives that develop thixotropy in non-aqueous and UV-cured coating systems (Formulation 5, Page 10). The thixotropic profile results in excellent pigment suspension, moderate viscosity increase, and good application properties (Exhibit 5). These rheology additives have minimal effect on other coating properties such as gloss, DOI, and durability. Troythix 150ACS and 250XF provide suspension of matting pigments in lacquers and varnishes, which allows for easy remixing of the matting pigment, resulting in a uniform finish with no pigment agglomerates.

Troythix 704SSA and 707SSA provide excellent pigment suspension in thin coatings such as lightly pigmented stains and dipping enamels.

Troythix 42BA and AntiSag 4 are products that can be post-added to oxidizing non-aqueous coatings for viscosity adjustment and sag resistance.

Exhibit 5



Dispersion Additive Recommendations

Table 4

Pigment Class	System Type		
	Non-Aqueous	UV-Cured	Aqueous
Titanium & Inorganic Pigments	Troysperse™ CD1 Troysperse 98C Troysperse 200SF Troysperse SD100	Troysperse 98C Troysperse 200SF	Troysperse 90W
Organic Pigments & Carbon Black	Troysperse CD1 Troysperse 98C Troysperse 200SF	Troysperse 98C Troysperse 200SF	Troysperse W Troysperse 90W
Transparent Iron Oxide	Troysperse CD1 Troysperse 98C Troysperse 200SF	Troysperse 98C Troysperse 200SF	Troysperse W Troysperse 90W
Bentonite*	Troysperse CD1 Troysperse SD100		

* See Formulation 1 for Bentonite Gelling

Non-Aqueous and UV Cured Coatings

Troy dispersing additives enhance the surface smoothness, opacity, and color development in pigmented wood and furniture finishes. They also provide excellent pigment suspension and improved resistance to color floatation.

Troysperse 98C is effective for the dispersion of transparent iron oxide pigments used in solvent stains. The use of Troysperse 98C results in stains with enhanced color strength and transparency (Exhibit 6). Troysperse 98C also promotes a high degree of color strength when used with carbon black and organic pigments. Troysperse 200SF provides performance comparable to Troysperse 98C and is solvent-free, thereby facilitating the formulation of low VOC coatings.

Troysperse CD1 promotes excellent dispersion of titanium dioxide and extender pigments. This results in finishes with excellent pigment suspension properties, resulting in coatings with enhanced surface smoothness and high gloss. Troysperse CD1 and SD100 are effective for the production of "Bentone" gels, providing smooth, easy-to-incorporate 10% gels (Formulation 1, page 9).

Aqueous Coatings

Troysperse 90W is a universal pigment dispersant for architectural and furniture coatings. The product provides excellent dispersion and promotes low viscosity when dispersing difficult pigments such as transparent iron oxides, carbon blacks, and organic pigments in aqueous coating systems. Troysperse 90W allows high pigment loading with fast dispersion time. It is very effective in making color pigment concentrates used for the tinting of aqueous coating systems. Coating properties show improved gloss and high color development when Troysperse 90W is used as the pigment dispersant.

Exhibit 6



Defoaming

Defoaming Additive Recommendations

Table 5

Function	System Type		
	Non-Aqueous	UV-Cured	Aqueous
Air Release	Troysol™ AFL	Troysol AFL	Troykyd® D230 Troykyd D729
Bubble Break	Troysol AFL Troysol 307	Troysol AFL Troysol 307	Troykyd D727 Troykyd D734 Troykyd D740 Troykyd D747

Non-Aqueous and UV Cured Coatings

Troysol AFL and 307 remove air entrained within a non-aqueous or UV-cured coating during manufacture and application. Troysol defoamers are effective in eliminating the air from porous substrates, such as wood. Entrained or displaced air must be eliminated from the coating before the coating dries to avoid unsightly film defects, such as craters, pinholes, and fisheyes. Troysol defoamers are used to control process foam (air release) and application foam (defoaming). These defoamers are often incorporated in combination with Troysol wetting additives to achieve the best balance of air release and surface smoothness (Formulations 4 & 5, Page 10).

Troysol AFL offers good performance in alkyd, NC, UP, and alkyd urethane coatings, and is particularly effective in removing microfoam. Troysol AFL also provides wetting properties, which aid in maintaining color uniformity, surface smoothness, and clarity (Exhibit 7).

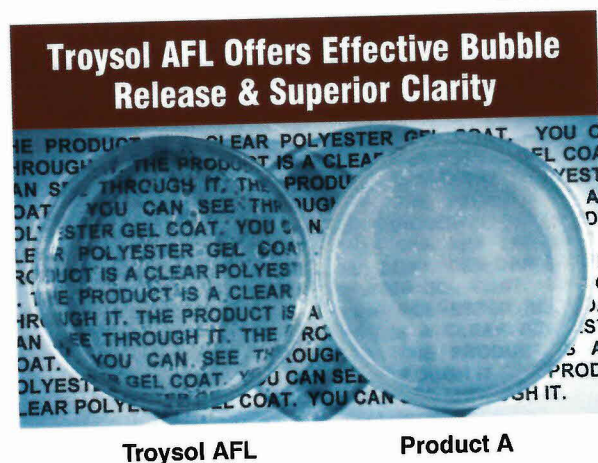
Troysol 307 is particularly effective in removing air in reactive coating systems, such as 2K urethane and UV-cured coatings.

Aqueous Coatings

Troykyd D740 is a strong silicone emulsion that offers good performance in most aqueous industrial coatings. It eliminates microfoam generated during coating application.

Troykyd D740 often provides air release during coating manufacture, eliminating the need for a process or grind defoamer. In severe cases of process or application foam generation, Troykyd D729 may be incorporated into the grind and Troykyd D740 into the let-down for optimum results. The use of Troykyd D740 in combination with Troysol LAC has proven effective in clear acrylic and urethane coatings for wood and furniture finishes.

Exhibit 7



Troysol AFL

Product A

In-Can Stability

Troy products for in-can stability include preservatives and anti-skinning additives. Mergal® in-can preservative products ensure maximum shelf stability by protecting the liquid coating from bacterial attack, which leads to product spoilage.

Troymax™ AntiSkin B is used with oxidizing coatings to prevent the formation of a surface skin during shelf storage of the liquid coating.

Additional information is available at www.troycorp.com. Please refer to your local Troy Sales Representative for more formulation specific recommendations.

Specialty Surface Additives

Troy manufactures a broad range of driers, drier stabilizers, drier accelerators, and sanding and flattening pigments for the wood and furniture finishes industry. With a wide variety of products in this category, Troy offers maximum compatibility for varying binder systems. Troy driers provide the required dry characteristics for each application. Troy sanding and flattening additives provide excellent surface properties during application for smooth, defect-free finishes.

Additional information is available at www.troycorp.com. Refer to your local Troy Sales Representative for more formulation specific recommendations.

Driers, Stabilizers, and Accelerators

Troymax driers, drier stabilizers, and drier accelerators ensure that oxidizing coatings have the required drying characteristics. Troymax PermaDry promotes drying stability for long periods of storage. Troymax 250 accelerates drying times and promotes drier stability for long periods in high solids solvent and water-reducible oxidizing coatings.

Troymax PermaDry is a lead-free performance drier designed to prevent loss of drying and maintain gel time upon aging. The use of Troymax PermaDry does not discolor white coatings like traditional cobalt feeder driers. It may reduce cobalt drier requirements, thereby reducing wrinkling.

Troymax 250 is an effective drier chelating agent used for drier acceleration and stabilization. Troymax 250 accelerates drying times and prevents loss of dry associated with high solids and water-reducible coatings.

Troymax Driers are available in a complete line of metallic carboxylates for a wide range of systems and applications.

Matting and Sanding Lubrication

Troymax 858 stir-in zinc stearate, when used in clear varnish sealers and lacquer sanding sealers, provides excellent dry film clarity and sanding lubrication with low dusting. It is very effective as a matting pigment to use in the production of satin and low sheen clear varnish and lacquer coatings.

Sample Formulations

Troy additives perform essential roles in coating performance. The following are sample formulations for a Bentonite Gel and four typical coatings in the wood and furniture finishes industry. The formulations detail base ingredients (resins, pigments, oils, et al) as well as Troy defoamers, rheology modifiers, wetting additives, and dispersants.

Premix

Formulation 2

Clear wood topcoats are common in the wood and furniture finishes industry. Aqueous clear wood finishes are being promoted as the use of organic solvents is becoming restricted. Troy additives help formulators overcome the difficult task of making aqueous coatings for wood applications.

Formulation 3

Sanding sealers are important components in wood finishes. Aqueous coating systems for wood require the use of a sealer to minimize grain raising and to seal the porosity of wood.

Formulation 1

Bentonite Gelling

Ingredients	Supplier	Parts by Weight
Mineral spirits (white spirits)		83.00
Bentone 38 or Bentone 34	Elementis	10.00
Troyperser CD1	Troy	5.00
Propylene Carbonate		2.00
Total		100.00

Formulation 2

Clear Aqueous Wood Topcoat

Ingredients	Supplier	Parts by Weight
Joncryl 1965	Johnson Polymer	65.14
Water		10.07
Troysol LAC	Troy	0.40
Water		9.13
Dipropylene Glycol Butyl Ether		1.36
1-phenoxy-2-propanol		1.10
Dipropylene Glycol Methyl Ether		3.72
Troykyd D740	Troy	0.60
Jonwax 26	Johnson Polymer	2.44
Troysol MS2	Troy	0.20
Water		5.49
Acrysol RM825	Rohm & Haas	0.35
Total		100.00

Typical Properties

Viscosity25-30 Secs/Ford #4 Cup

Formulation 3

Stearated Vinyl Toulene Alkyd Sanding Sealer

Ingredients	Supplier	Parts by Weight
Keltrol 1074-60VMP	Reichold Chemicals	59.56
Troymax 858	TroyCorporation	3.46
White Spirits		31.16
Troymax Cobalt 6%	Troy Corporation	0.28
Aromatic High Flash Naphtha		5.54
Total		100.00

Typical Properties

Viscosity.....40-45 Secs/Ford #4 Cup
 60° Gloss25
 20° Gloss30

Formulation 4

Polyurethane clears are some of the most common finishes for wood. Typical applications include sealers and varnishes for wood and veneer furniture, paneling, and flooring. Troy products promote substrate wetting, surface flow, slip and mar, and air release when used in urethane coatings.

Formulation 5

NC coatings are extensively used for furniture and wood finishes. Troy additives enhance the performance of these quick drying durable coatings.

Formulation 5**NC White Gloss Finish**

Ingredients	Supplier	Parts by Weight
Short oil alkyd RS 5222, 60%	Revertex	28.20
Troythix 150ACS	Troy	2.00
Toluene		2.90
Troysperse CD1	Troy	0.12
CR-828 (TiO ₂)	Kerr McGee	14.32
High Speed Dispersed - 15 Minutes		
Short oil alkyd RS 5222, 60%	Revertex	13.58
Troysol AFL	Troy	0.40
Methyl Ethyl Ketone (MEK)		3.60
Diocetyl Phthalate (DOP)		0.45
Butyl Acetate		4.40
Troysol MS2	Troy	0.30
Butyl Acetate		3.29
MEK		4.54
Toluene		4.80
Isobutanol		2.30
NC ½ sec		14.80
Subtotal		100.00
Thinning Solvent		40.00

Typical Properties

Viscosity	80-85 KU/Stormer
60° Gloss	90
20° Gloss	65

**Dissolve
NC in the
solvents
and then
add to above**

Thinning Solvent

Xylene	300
Ethyl Glycol Acetate	300
Solvesso A100	300
Isobutyl Acetate	100
Total	1000

Note: Adjust lacquer viscosity with thinning solvent for spray.

Polyurethane Clear Wood Finish

Ingredients	Supplier	Parts by Weight
Part A		
Short oil alkyd Dp5101	Revertex	77.13
Butyl Acetate		22.17
Troysol 307	Troy	0.40
Troysol MS2	Troy	0.30
Total		100.00
Part B		
Desmodur L	Bayer	60.37
Butyl Acetate		39.63
Total		100.00

Mix Part A and Part B at the following ratio prior to use:
Part A : Part B = 3 : 2

Typical Properties

Viscosity	20-25 Secs/Ford #4 Cup
60° Gloss	98
20° Gloss	96



Shown above is a typical high gloss wood finish applied in a heavy-use area in which durability is as important as aesthetic value. Troy additives can help formulators achieve most desired effects and attributes in their coatings.

Services

As a Performance Partner, Troy offers a variety of services to support our product line of preservatives and additives to meet customer needs and provide market solutions.

Troy invites you to take advantage of the Troy services that can help you achieve your market objectives.

- Technical Service representatives can provide formulation assistance, product evaluation, and microbiological, analytical, and field testing to assist you in developing an optimum formulation that meets your product objective.
- Regulatory support is offered globally with regional and national expertise to meet your needs.
- R&D scientists constantly work to anticipate future industry needs and develop innovative technology. Contact your Troy representative to discuss your unique requirement that may not be met by materials currently on the market. In fact, Troy may have just what you need already under development and if not, may be able to work with you to achieve your objective.
- A global supply network is in place to ensure product availability and fast delivery. Contact your local representative to ensure the product you need is available when you need it.

Call your nearest Troy representative for immediate assistance or visit us online at www.troycorp.com. When visiting the website, become a registered user to obtain access to a wide range of resources.



The Gold Standard for Performance

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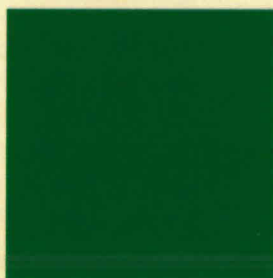
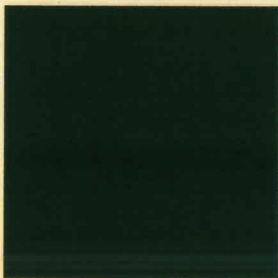
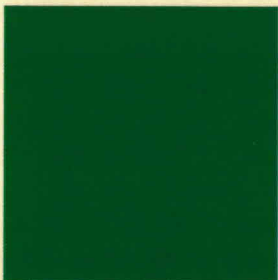
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Performance Additives

FOR AQUEOUS ADHESIVES



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The Gold Standard for Performance

7/11/13

C Contents



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I ntroduction

Troy is a recognized global supplier of performance additives and has served the adhesives and sealants markets with advanced products and solutions for decades. Our technical and research and development teams are developing value-added solutions to meet your evolving needs. Troy additives for the adhesives and sealants industry are custom-developed for optimized performance in these systems and comply with the requirements of the US Food & Drug Administration (FDA) for various uses in adhesives applications (Page 7, Table 2).

Troy manufactures high performance defoamers and wetting additives for the adhesives and sealants markets under the Troykyd® and Troysol™ brand names the industry recognizes for optimum surface control and efficient defoaming. Troy also manufactures highly effective Polyphase®, Mergal®, and Troysan® preservatives for dry film and in-package microbial control in adhesives and sealants. The Troy package of performance products for adhesives and sealants constitutes a technological response to customer requirements for performance and responsible care for safety and environmental concerns.

Troykyd® Defoamers

Aqueous adhesives, such as pressure sensitive adhesives, require the use of defoamers. Defoamers are needed during the manufacturing process, and therefore must be quite dispersible. Troykyd defoamers for adhesives are readily dispersible, allowing quick and thorough incorporation even in very viscous systems. Defoamers are also required for the application of the adhesive, whether a curtain coater, roll coater, or extrusion equipment is used. Troykyd defoamers offer good application defoaming without adverse side effects.

Troykyd defoamers are compatible with the various resin systems used for adhesives. Compatibility is essential because any pinholes, fisheyes, or craters on the substrate could lead to bond failures. In addition, any remaining microfoam produces poor film appearance and increases susceptibility to bond failures. Troykyd defoamers for adhesives are based on silicone-free technology in order to provide the optimal conditions of good defoaming properties and compatibility (Page 7, Table 1). Silicone-based defoamers are generally less desirable because they may not have satisfactory spreading properties in adhesive applications. Furthermore, the tendency of such defoamers to migrate to the surface may lead to failure at the interfaces.

Troykyd® D04 provides efficient defoaming in packaging adhesives. It is silicone-free and water-dispersible for ease of incorporation.

Troykyd D11 is especially effective in pressure sensitive adhesives. It is also an effective defoamer for viscous phenol-formaldehyde based adhesives applied to laminated veneer lumber (LVL) using the curtain coater method. The silicone-free composition of Troykyd D11 is advantageous as it does not adversely affect curtain integrity.

Troykyd D727 is effective in high speed laminating applications in which a silicone-containing defoamer can cause breaks in the application curtain. It is effective for core winding and corrugating adhesives and is also used in consumer emulsion type adhesives.

Troykyd defoamers for adhesives and sealants comply with US FDA requirements (Page 7, Table 2) for use in these applications.

Wetting Additive

Troysol™ LAC is a multi-purpose additive that complies with the requirements of the US FDA for use across a wide range of aqueous adhesives, including those involving food contact (Page 7, Table 2). Troysol LAC provides improved substrate wetting and adhesion over difficult non-porous substrates, such as polyethylene terephthalate (PET), high-density polyethylene (HDPE), polypropylene, vinyl, and wax-coated paper. It substantially reduces surface tension, enabling more uniform coverage over these low energy substrates, and over contaminated surfaces as well. Use of Troysol LAC eliminates the crawling that may occur on difficult-to-coat substrates. The enhanced leveling imparted by Troysol LAC ensures that the adhesive film is uniform. Troysol LAC provides better film strength and integrity, and resists the formation of zippery bonds. Lab testing also shows that improved substrate wetting achieved with the use of Troysol LAC can improve the tensile strength in pressure sensitive adhesives (Page 4, Exhibit 1). Wetting additives help formulators achieve defect-free films with excellent surface appearance. Many systems require a defoamer/wetting additive system to optimize performance. Testing indicates that concentrations of 0.2-0.4% Troysol LAC achieve optimal performance.

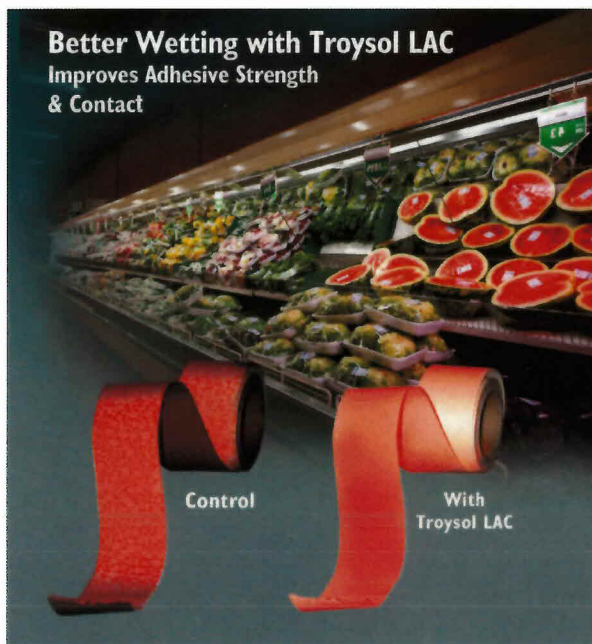
In-Package Preservatives

Mergal® K10N is a VOC-free, low viscosity, aqueous preservative recommended for use in waterborne adhesives and sealants. Solvent- and surfactant-free, the product is compatible with most aqueous systems and may be added without dilution. Mergal K10N complies with US FDA requirements for use in a wide range of adhesives (Page 7, Table 2).

Troysan® 395 is a clear, water-soluble liquid preservative for control of bacteria in adhesives. Stable in both alkaline and acidic conditions, Troysan 395 combines protection with safe handling characteristics, low toxicity, and low odor. Troysan 395 is stable at elevated processing temperatures and has a low VOC content. The product also complies with US FDA requirements (Page 7, Table 2).

Dry Film Preservatives

Polyphase® A103 is a new dry film preservative for adhesives applications. The product is effective against a wide variety of fungal organisms (mold, mildew, and staining). Polyphase A103 has low toxicity, is metal-free, contains no alkylphenol-ethoxylates, and complies with US FDA requirements for use in adhesives (Page 7, Table 2).



Formulations with Troy Performance Additives

Pressure Sensitive Adhesive

Troykyd® D11/Troysol™ LAC System

Use of Troykyd D11 for defoaming and Troysol LAC for wetting has shown a combination of desirable properties when used in pressure sensitive adhesives applied over low energy substrates such as PET and HDPE. The combination of Troy additives promotes excellent substrate wetting, improved adhesion, and enhanced surface flow, resulting in a surface free of defects. Typical adhesives in this area are based on acrylics and acrylic copolymers (Formulations 1 and 2).

Because of these products' compatibility properties, they are well suited for use in pressure sensitive adhesives. Troykyd D11 is a very effective defoamer in acrylic resin systems without the use of silicones. The product is very compatible and does not compromise tensile strength properties. Troysol LAC, as incorporated into Formulation 1 (Acrylic Copolymer Pressure Sensitive Adhesive), provides improved substrate wetting which leads to improved adhesion properties, as indicated by the relative tensile strength results shown in Exhibit 1. Typical end uses are tapes, labels, and poly bags. The optimum use level for Troysol LAC in such applications is 0.2-0.3%.

Formulation I

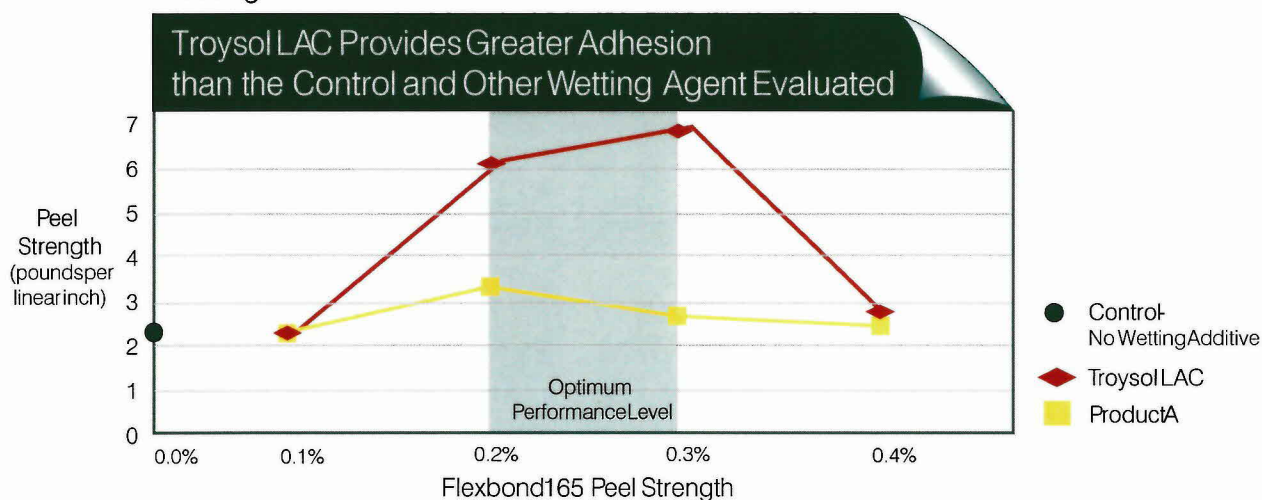
Acrylic Copolymer Pressure Sensitive	% Weight
Flexbond 165 (Air Products)	79.0
Aquatack 6085 (Arizona)	15.0
Troykyd D11	0.3
Troysol LAC	0.3
Troysan 395	0.2
Water	5.2
Total	100.0
Physical Properties	
Viscosity	1100 - 1300cps*
pH	4.5 - 5.5
Tensile Strength	
Control	2.2pli**
With Troysol LAC Wetting Additive	6.2pli

* Centipoise

**Pounds per linear inch

Exhibit I

Testing in Formulation 1:



Formulation 2

Acrylic Pressure Sensitive Adhesive	% Weight
Eastarez 2050 (Eastman)	83.5
Tackolyn 3179HA (Eastman)	14.5
Acrysol RM2020 (Rohm & Haas)	1.2
Troykyd D11	0.3
Troysol LAC	0.3
Mergal K10N	0.2
Total	100.0
Physical Properties	
Viscosity	1200 - 1400cps
pH	7 - 8
Tensile Strength	
Control	2.1pli
With Troysol LAC Wetting Additive	2.9pli

Formulation 3

Polyvinyl Alcohol Systems	%Weight
Water	87.6
Celvol 205S (Celanese)	12.0
Troykyd D727	0.2
Troysan 395	0.2
Total	100.0
Physical Properties	
Viscosity	60-100cps
pH	5.5

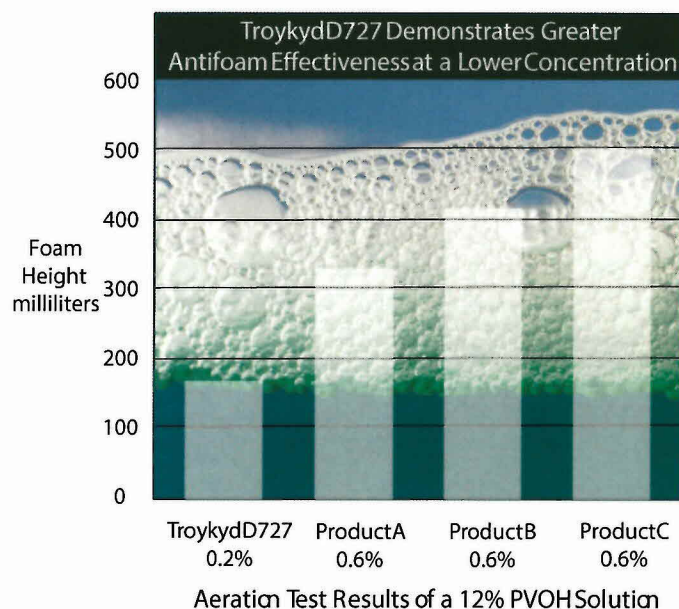
Polyvinyl Alcohol Adhesive

Troykyd D727 Silicone-Free Antifoam

Troykyd D727 is an effective antifoam additive for polyvinyl alcohol based adhesives (Formulation 3). This polyvinyl alcohol system is cooked to 180°-195°F. After the adhesive reaches proper consistency, it is typically cooled to 140°F.

In the end use as a lamination adhesive, this system will provide a smooth lamination without any gaps that could adversely affect laminations. Troykyd D727 precludes foam formation in the glue pots, which otherwise would tend to form skins, and therefore adversely affect film application (Exhibit 2). Typical end use applications are spiral tube winding, bookboard laminations, and predispersion intermediates for additions to adhesive formulas.

Exhibit 2



Formulations with Troy Performance Additives

Polyvinyl Acetate Adhesive

Troykyd® D04 Silicone-Free Defoamer

Troykyd D04 is an effective defoamer for general packaging applications with polyvinyl acetate and vinyl acetate/ethylene resin systems (Formulation 4). Troykyd D04 is effective as a process aid defoamer used in conditions in which the defoamer must be very compatible and is added for the purpose of controlling process foam and achieving consistent specific gravity in the finished adhesive. Troykyd D04 will help improve yield and reduce process time.

Formulation 4

Polyvinyl Acetate Resin Systems	% Weight
Polyvinyl Acetate (55% solids)	80.0-85.0
Benzoflex 50 (Velsicol)	10.0-15.0
Troykyd D04	0.2
Troysan 395	0.2
Water	qs*
Total	100.0
Physical Properties	
Viscosity	1000 - 1500cps
pH	5

* Quantum sufficit

Acrylic Copolymer Based Adhesive

Troykyd D727/Troysol™ LAC System

Troysol LAC is beneficial with acrylic copolymer based adhesive systems that are used on difficult substrates such as vinyl, waxy paper and other coated paper, avoiding zippery bonds. This combination of a silicone-free defoamer and wetting additive optimizes efficiency in the system, allowing reduced additive use. Troykyd D727 may be utilized at only 0.2-0.3% levels in these systems. This negates the need for silicone-based defoamers (Formulation 5).

Formulation 5

Acrylic Copolymer Adhesive Systems	% Weight
Flexbond 165 (Air Products)	95.7
Troykyd D727	0.3
Troysol LAC	0.3
Mergal K10N	0.2
Water	3.5
Total	100.0
Physical Properties	
Viscosity	1000 - 1500cps
pH	9

Adhesives Application Reference Chart

Table 1

Application Selector	Wetting	Defoamers		
	Troysol LAC	Troykyd D04	Troykyd D11	Troykyd D727
	Anionic	Silicone-Free	Silicone-Free	Silicone-Free
Physical Properties				
Viscosity	C Max*	800cps**	1200cps**	1800cps**
Dispersibility	Good	Moderate	Good	Moderate
AdhesiveMarketSegment				
PressureSensitive				
Acrylic	.	.	.	
NaturalRubberLatex(NRL)	.	.	.	
Lamination				
Acrylic	.		.	.
Urethane	.			.
WoodLaminations				
Phenolic	.			.
Polyvinylacetate(PVA)	.			.
Packaging				
Polyvinylacetate(PVA)	.		.	
Vinylacetate/ethylene(VA/E)	.		.	
Converting				
Polyvinylacetate(PVA)	.		.	.
PolyvinylAlcohol(PVOH)	.		.	.
Starch	.		.	.

* Gardner Bubble Method

** Brookfield measurement

Table 2

U.S. FDA Compliance		Troysol LAC	Mergal K10N	Polyphase A103	Troysan 395	Troykyd D04	Troykyd D11	Troykyd D727
Title 21 CFR Section	Section Description							
175.105	Adhesives	✓	✓	✓		✓	✓	✓
176.170	Components of paper and paperboard in contact with aqueous and fatty foods	✓	✓		✓			
176.180	Components of paper and paperboard in contact with dry food	✓	✓					
176.200	Coatings					✓	✓	✓

Services

As a Performance Partner, Troy offers a variety of services to support our product line of preservatives and additives to meet customer needs and provide market solutions.

Troy invites you to take advantage of the Troy services that can help you achieve your market objectives.

- Technical Service representatives can provide formulation assistance, product evaluation, and microbiological, analytical, and field testing to assist you in developing an optimum formulation that meets your product objective.
- Regulatory support is offered globally with regional and national expertise to meet your needs.
- R&D scientists constantly work to anticipate future industry needs and develop innovative technology. Contact your Troy representative to discuss your unique requirement that may not be met by materials currently on the market. In fact, Troy may have just what you need already under development and if not, may be able to work with you to achieve your objective.
- A global supply network is in place to ensure product availability and fast delivery. Contact your local representative to ensure the product you need is available when you need it.

Call your nearest Troy representative for immediate assistance or visit us online at www.troycorp.com. When visiting the website, become a registered user to obtain access to a wide range of resources.



The Gold Standard for Performance

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Troy Corporation...

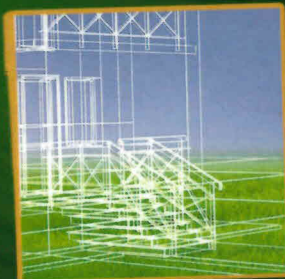
Your Partner for Success

An ISO 9001:2008 and ISO 14001:2004 Certified Company

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Troy Corporation

A LOOK AT THE COMPANY AND ITS VISION



The Gold Standard for Performance

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2012

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Who We Are

Troy Corporation develops and manufactures performance materials for industry, which are used and available in over 100 countries to produce high performing, cost-effective, and sustainable end-use products. Troy's objective is to enable customers to lead in their marketplaces, drawing on the knowledge and expertise gained from serving a diversity of markets worldwide for over 60 years. Troy customers include the leading manufacturers in their respective industries; the company's

products assist manufacturers and formulators to address the changing needs of the global market.

Troy produces a comprehensive range of preservatives, performance additives, and metal carboxylates at modern manufacturing facilities on three continents. Troy supports customers with worldwide sales offices, distributors, warehouses, and logistics facilities. The company's goal is to provide customers with a superior level of service and product availability.



Our Management Philosophy

Troy Management is comprised of a dedicated group of leaders with extensive experience. Management employs a customer-driven focus, as well as a philosophy that places customer needs as the highest priority. Troy Management is committed to the success and growth of customers, focusing on strategic investments as well as product line, service, and geographic expansion, enabling its global customer base to lead in their respective markets. Troy places an emphasis on providing industry-leading technical service centers, as well as a significant investment in Research & Development to accommodate the needs of its customers in years to come.



Our Mission

Troy is a technology company providing environmentally sound performance products to customers worldwide. Troy products meet unique customer requirements and add value in a wide range of end-use markets, including coatings, wood preservatives, inks, plastics, adhesives, metal processing fluids, HI&I, personal care products, and energy, to name a few.

Troy is a growth company, with objectives to increase existing business by 10 percent each year and supplement internal growth with selective acquisitions. Troy is a global organization, marketing products in all world markets

in proportion to their economic potential. Troy is fully integrated, with manufacturing in locations best suited to serve customers.

Troy believes that profit is a by-product of serving customers exceptionally well, which is our primary objective. The company strives for a level of profitability and return on investment that places it in the top quartile of industry.

Above all, Troy seeks to serve its customers, by providing innovative, high-quality solutions to unique customer needs and offering comprehensive technical service.

The Values That Guide Us

We operate with integrity and truthfulness in our relationships with customers, suppliers, and employees.

We strive for the highest quality in all that we do.

We want to be known for innovation and superior service.

We are a group of dedicated professionals who value teamwork.

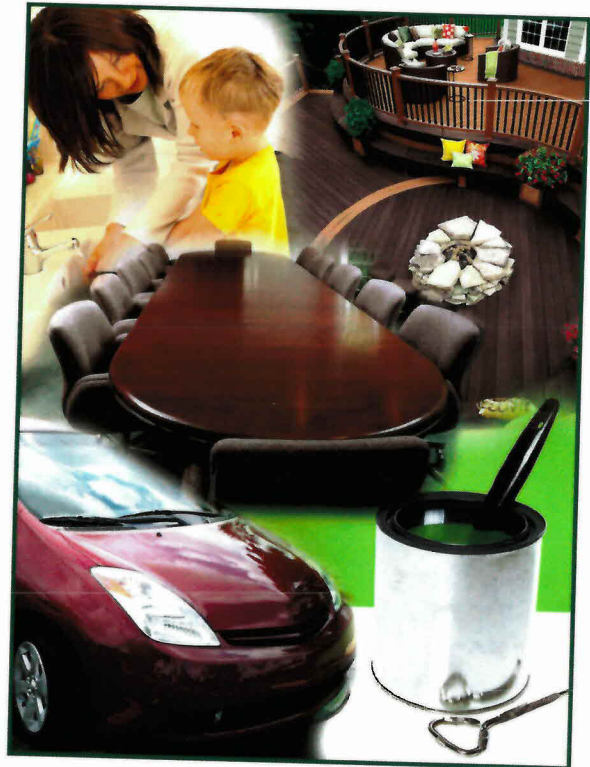
We strive for excellence. We are achievers.

We are committed to open and honest communication.

Industries Served

Known as *The Gold Standard for Performance*, Troy is committed to excellence, delivering unique, high value propositions to the marketplaces we serve. As a global organization, Troy is well-positioned to continue leading as well as successfully forging new paths into markets with strong growth potential. Some of the industries that Troy serves include:

- Adhesives
- Plastics
- Sealants
- Energy
- Grouts
- HI&I
- Inks
- Paper
- EIFS and Plasters
- Emulsion Polymers
- Mineral Slurries
- Polyester Resins
- Powder Coatings
- Roof Coatings
- Personal Care
- Urethanes
- Automotive Coatings
- Wood Preservation
- Lubricants
- Pigment Dispersions
- Construction Products
- Lubricants & Cutting Oils
- Metal Processing Fluids
- Textiles & Textile Coatings



Brands

TroyGuard™
TroyCare™
Troykyd®
Bodoxin®
Polyphase®
Micropel®
Troysan®
Plastiguard®
Fungitrol®
Nuosept®
TroyCat™
Bacillat®
Troymax™
Troythix®
Mergal™
Troysol™
Oilmate™
Troyshield™
EBOTEC®
Powdermate®
Grotan®
Troysperse™

Troy's brands, such as Polyphase®, are regarded globally as benchmarks for product excellence. The Troy portfolio includes some of the most widely recognized names in the industries we serve, including paints & coatings, metal processing fluids, personal care, HI&I, and energy. Synonymous with innovation, performance, sustainability, and value, Troy's brands offer the leading technology to provide customers with an advantage in the marketplace.

Troy's premier portfolio of preservatives has been enhanced through strategic acquisitions, enabling Troy to reach more markets and geographies, and offer customers greater formulating flexibility. Recent additions include the Fungitrol® and Nuosept® preservative brands, as well as Bodoxin®, Bacillat®, and others.

Performance Products

- Fungicides
- Algacides
- Bactericides
- Industrial Disinfectants
- Microbial Detection Kits
- Defoamers
- Wetting Agents
- Flow & Leveling Agents
- Rheology Modifiers
- Powder Coating Additives
- Driers & Catalysts
- Dispersants

Dry-Film & Wood Preservatives

Polyphase®, **Troysan®**, and **Fungitrol®** dry-film preservatives protect aqueous and solvent-based paint films, plasters, building, and other surfaces from microbiological attack, including fungi, mold, mildew, yeasts, and algae. Even in the most difficult climates, Troy fungicides, mildewcides, and algacides keep industrial and consumer products free of microbial growth. **Micropel®** and **Plastiguard®** preservatives provide a wide range of chemistries for plastics protection, including antimicrobials with high temperature stability.

Wet-State and In-Process Preservatives

Mergal® and **Nuosept®** wet-state and **Troyshield®** in-process preservatives and sanitizers remove harmful bacteria, fungi, algal, and virus microorganisms from products and production processes and extend the shelf-life of consumer and industrial products.

Defoamers and Antifoams

Trokyd® defoaming additives eliminate entrapped air, evolved gases, and moisture vapor from products and production processes. Troy provides a complete line of defoamers for aqueous and solvent systems.

Substrate Wetting, Flow, and Leveling

Troysol™ additives reduce surface tension for the control of product properties, enhancement of surface appearance and integrity, and elimination of film defects. The result is complete substrate wetting and improved adhesion.

Mar Resistance & Slip Agents

Troysol™ additives enhance surface appearance and performance – important attributes in the finished product. Troy additives allow the formulation of films with excellent resistance to mar and abrasion, with increased surface slip.



Rheology Modifiers

Troythix® rheology modifiers improve the storage, application, and appearance of manufactured products and production processes and enable precise control of the rheological properties of the materials to which they are added. Troythix rheology products enable control of viscosity, settling resistance, sag resistance, and surface flow and leveling.

Powder Coating Additives

Powdermate® additive products control coating properties to enable powder coating manufacturers to create value-added, high performance coatings. The Powdermate product line includes flow and leveling, degassing, pigment and substrate wetting, and texturing additives.

Driers & Catalysts

Troymax™ driers and chelating agents are used to accelerate the drying process and resist loss of dry. Troymax driers are available in a complete range of metallic salts for a wide range of systems and applications.

Anti-Skinning Agents

Troymax™ anti-skinning additives maintain the integrity of the paint or varnish during storage and in packaging, enabling it to resist congealing, clumping, and skinning.

Dispersants

Troysperse™ dispersants provide improvement in pigment dispersion and stabilization of the dispersed pigment. Lower processing times, higher pigment loading, and improved color strength are achieved using Troy dispersants.

Specialty Products for Energy

Oilmate™ hydrogen sulfide (H₂S) scavengers perform an important function in oil & gas extraction and processing. By controlling H₂S emissions, Oilmate™ products provide safety, health, and environmental as well as anti-corrosion benefits to energy producers.

S

ervices



Troy offers a full portfolio of value-added services to support its customers worldwide, and to augment its broad product range. Through custom solutions and market-focused expertise, Troy's technical and related services enable customers to produce high-quality products and to lead in the competitive marketplace. Troy has the knowledge and expertise to add value to its customers' products and processes, with over 60 years of experience serving a diversity of industries.

Technical Service

Technical Service representatives provide formulation assistance, product evaluation, microbiological, analytical, and field testing to assist customers in developing optimized formulation that meet performance and market objectives. Research & Development scientists develop innovative technology in anticipation of future market trends. Troy has numerous Technical Service Centers located strategically worldwide to assist customers, including a new, state-of-the-art Science & Technology Center at the company's Global Headquarters in New Jersey, USA.

Field Testing

Troy maintains ten field testing sites worldwide to evaluate the performance of dry-film preservatives under a wide range of environmental conditions. Troy field testing sites are located in areas that are subject to a variety of severe microbial threats, such as common mold, mildew, fungi, wood destroying fungi, yeast, and algae. Troy preservatives are evaluated over long periods of time in a diversity of climatic conditions to ensure that customers' finished products perform as expected.

TMMA

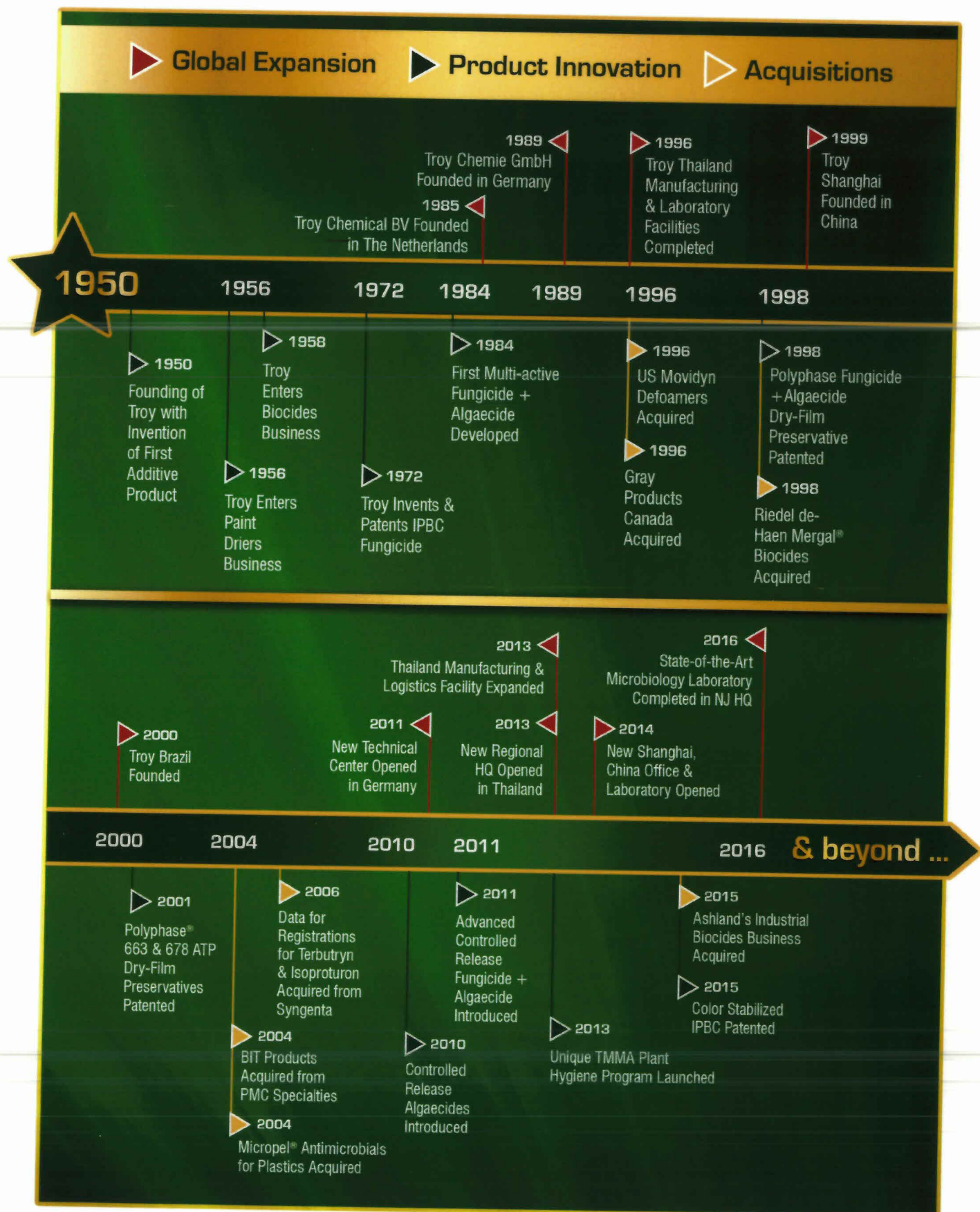
Created to enable customers to achieve contamination-free products and processes, and to reduce preservation cost, the Troy Microbial Management Advantage (TMMA) is a unique value-added service offered to customers worldwide. With the growing global regulatory trend toward 'green' and aqueous systems, TMMA is an increasingly important program. TMMA consists of plant hygiene audits, microbiological identification, efficacy testing, and preservative optimization analysis, orchestrated by Certified TMMA Practitioners, who have completed extensive training to identify root causes of contamination. Certified TMMA Practitioners then custom-develop preservative recommendations as well as optimized use levels to enable customers to achieve excellent performance while also meeting regulatory, sustainability, and cost-in-use goals.

Regulatory Support

In an era of increasing legislation by government agencies worldwide regarding the use of preservatives, Troy's experienced Regulatory Affairs department assists customers to achieve their objectives, while meeting all relevant regulatory requirements. With team members in the US, Europe, and Asia, Troy offers regulatory support globally with regional and national expertise to meet customer needs and enable them to successfully produce and market high-quality, compliant products.

Call your nearest Troy representative for immediate assistance or visit us online at www.troycorp.com. When visiting the website, become a registered user to obtain access to a wide range of resources.

Timeline, History & Significant Milestones



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